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Plant Breeding Abstracts

Vol. XXVII, No. 4

C. A. B.
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MLE

STATISTICS

3612 Scossiroli, R. E. & Scarascia, G. T.
Applicazioni della statistica in agricoltura. (I nota). (**Applications of statistics in agriculture. Note I).**
Tabacco, Roma 1957 : **61** : No. 682 : 50–65.

The calculation of such values as mean, variance and standard error is explained.

3613 Scossiroli, R. E. & Scarascia, G. T.
Applicazioni della statistica in agricoltura. (II nota). (**Applications of statistics in agriculture. Note II).**
Tabacco, Roma 1957 : **61** : No. 682 : 66–83.

The use of the *t* test to compare population means is outlined.

3614 Geidel, H.
Zum Ausgleich von Bodenunterschieden bei Blockanlagen. (**On compensating for soil differences in randomized-block layouts).**
Z. Acker- u. PflBau. 1957 : **103** : 71–82.

The theoretical basis and applicability of the method proposed by Müller (cf. *PBA**, XXVI, Abst. 1941) are further discussed.

3615 Zimmermann, K. F.
Feldversuchswesen: Vereinfachtes Rechenschema für Blockversuche und Lateinische Quadrate. (**Field experimentation: a simplified system of calculation for block experiments and Latin squares).**
Züchter 1957 : **27** : 89–92.

Tables are given from which significant levels for the variation within and between treatments can be read off for a given number of treatments and replications, thus saving time in the working out of large numbers of experimental data.

3616 Rundfeldt, H.
Zur Berechnung eines optimalen Verhältnisses zwischen der Anzahl der Prüfjahre, der Prüforte und der Vergleichsteilstücke bei Feldversuchen. (**The calculation of the optimum relationship between number of years of testing, of locations of the test and of comparison plots in field experiments).**
Z. Pflanzenz. 1957 : **37** : 192–201.

In an experiment with 6 spring wheat varieties tested in 6 plots at each of 6 localities for 3 years, the interactions were all greater than 0, from which it is concluded that results of a single experiment are of little value in assessing the yielding capacity of any of the varieties. The interaction variety-year was smaller than that of variety-location, so that in this particular case an increase in the number of locations to 8 or 16 would be more advantageous than an increase in the number of years. An increase in the number of plots brought hardly any advantage at all and 2 to 3 is considered to be the optimum number for each location.

GENETICS

3617 Grant, V.
The development of a theory of heredity.
Amer. Scient. 1956 : **44** : 158–79.

Stressing the need for a broader interpretation of the history of genetics, the author reviews early work on embryology, cytology, heredity, variation and evolution, forming the background to the development of Mendelian genetics.

3618 Buchinger, A.
Mendel zum Gedenken. (**In memory of Mendel).**
Bodenkultur 1957 : **9** : 251–52.

At a Mendel centenary celebration at Gumpenstein, Austria, A. Buchinger, the first speaker, reminded his hearers that 100 years ago Mendel began his genetic researches and 50 years ago the first professorial chair for plant breeding in Europe was founded in Vienna. Some new light was shed on the rediscovery of Mendel's paper, namely that the three discoverers were all in some degree influenced by Rümker. A memorial to Mendel was unveiled, a letter from E. Tschermak-Seysenegg was read and addresses were given by W. Rudorf and J. C. Dorst, the former mentioning the contributions of Correns and Baur to the later development of genetics, the latter those of de Vries. Finally F. Piatti pointed out that doubts as to the validity of the Mendelian laws were less clamorous now in certain quarters than a few years ago.

3619 Imšenetskiĭ, A. A.
(**A genetical symposium in Japan).**
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1957 : No. 1 : 63–67. [Russian].

A brief report on an international genetical

conference in Tokyo in September 1956 is presented (cf. Abst. 1003).

3620 Rostand, J.
Lucien Cuénot.
Genetics 1957 : **42** : 1–6.
This biographical note gives an appraisal of Cuénot's genetical and evolutionary work.

3621 Rostand, J.
Un précurseur de Mendel, le pharmacien Colladon. (**A forerunner of Mendel, the apothecary Colladon**).
CR Acad. Sci., Paris 1957 : **244** : 2973–74.
Extracts are presented from a report of experiments by L.-T.-F. Colladon of Geneva on crossing grey and white mice, published in the *Ann. Sci. Nat.* 1824 : 1 : 179. It is thought that Mendel may have been acquainted with this work, in which the progenies consisted of the parental types only without any intermediate forms.

3622 Auerbach, C.
Genetical effects of radiation and chemicals.
Experientia 1957 : **13** : 217–24.
The topics discussed include a brief discussion of the chromosome theory of inheritance, the action of radiation on genetic material by causing chromosome breakage and mutations, dose-effect relations, the relative frequencies of different types of genetical effect and sensitivity differences between germ cells at different stages of development, principally with reference to man and other animals.

3623 Hudson, J. P.
Control of the plant environment.
Nature, Lond. 1957 : **179** : 1173–75.
Contributions to the Easter school held in April 1957 by the University of Nottingham on Control of environment in crop experimentation are summarized. The lectures included one by P. T. Thomas showing how controlled environments could be used in genetical research.

3624 Pateman, J. A.
Polygenic inheritance of ascospore size in *Neurospora crassa*.
Heredity 1957 : **11** : 153–54. (Abst.)
Selection for large ascospores in *N. crassa* at the Department of Genetics, Sheffield University, has increased the mean size in 16 generations although the frequency of asci containing only four spores about twice the size of normal ascospores has also increased. The range of mean ascospore size found in F_1 and backcross progeny indicates that a considerable number of genes affecting ascospore size differentiate the selected and wild type strains.

3625 Cave, M. S. & Brown, S. W.
The detection and nature of dominant lethals in *Lilium*. III. Rates of early embryogeny in normal and lethal ovules.
Amer. J. Bot. 1957 : **44** : 1–8.
Examination of ovaries 16 days after pollination with normal pollen, X-irradiated pollen carrying dominant lethals (cf. *PBA*, XXIV, Abst. 2607) or mixed normal and lethal pollen, showed that development was generally slower and more variable in the lethal than in the normal ovules. Greater retardation occurred in embryo than in endosperm development, indicating the importance of gene dose. Indications of a hormonal effect were provided by the observation that in the mixed ovaries, the lethal ovules developed more slowly and the normal ovules faster than their counterparts in the exclusively lethal or normal ovaries. The lethal effect is visualized as an initial retardation of nuclear division, followed by further retardation and final disintegration of nuclear materials as a result of excess hormone.

3626 Catcheside, D. G.
The genetics of micro-organisms.
Advanc. Sci. 1957 : **13** : 481–85.
This short survey deals chiefly with modes of transfer of genetic material in *Escherichia* and *Salmonella* and the role of the cytoplasm in inheritance in *Paramecium* and other micro-organisms.

3627 Vidaver, G. A. & Kozloff, L. M.
The rate of synthesis of deoxyribonucleic acid in *Escherichia coli* B infected with T2r$^+$ bacteriophage.
J. biol. Chem. 1957 : **225** : 335–47.
Incorporation of 5-hydroxymethylcytosine into the DNA fraction of phage-infected *E. coli* was used as an index of synthesis of phage DNA. Little or no DNA was synthesized until 6·5–7 minutes after infection with nonirradiated virus. Under conditions of multiplicity reactivation upon infection with ultraviolet-irradiated phage, the amount of DNA formed was comparable to that produced when nonirradiated phage was used, but synthesis was delayed. Little or none of the DNA of ultraviolet-irradiated phage, including the portions not hit, was replicated in the absence of multiplicity reactivation. Upon multiple infection with X-irradiated

phage, a considerably greater synthesis of DNA occurred than could be accounted for by the presence of undamaged virus; the amount produced was however much lower than that synthesized by ultraviolet-treated phage under comparable conditions. The bearing of the results upon hypotheses concerning multiplicity reactivation and genetic recombination in phage is discussed.

3628 PAYNE, L. C.
The theory of genetical recombination: effect of changing the $\frac{1}{4}\chi^2_4$ intercept length distribution.
Heredity 1957 : **11** : 129–39.

A relatively simple comparison of the $\frac{1}{4}\chi^2_4$ and $\frac{1}{6}\chi^2_6$ distributions for intercept length is presented. The detailed mathematical study was summarized in *PBA*, XXVI, Abst. 1950.

3629 GRIFFING, B.
Linkage in trisomic inheritance.
Heredity 1957 : **11** : 67–92.

Fisher's general theory of linkage in polysomic inheritance (cf. *PBA*, XVII, Abst. 1381) is applied to organisms of chromosome constitution $2n + 1$. The topics considered are the number of possible genotypes, the enumeration of isomorphic genotypic sets, the classification of monosomic and disomic gametes, and the estimation of genetic parameters from the appropriate gametic matrices. A numerical example is worked out, based on data on crossing over in tomato trisomics published by Lesley (cf. *PBA*, VII, Abst. 1388).

3630 KAUFMANN, B. P., GAY, H. & MCELDERRY, M. J.
Effect of ribonuclease on crossing over in *Drosophila*.
Proc. nat. Acad. Sci. USA 1957 : **43** : 255–61.

The frequency of crossing over was modified by ribonuclease and by ethylenediamine tetraacetic acid (EDTA), the intensity of the effect being a function of the concentration. Ribonuclease acted preferentially in increasing recombination within one region of the X chromosome and EDTA within an adjoining region. The segment within which ribonuclease had this preferential effect encompassed intercalary heterochromatic regions. It is suggested that the two substances do not modify the frequency of crossing over solely by direct action on the chromosomes but cause changes in the nucleoprotein structure as a consequence of alterations of the intracellular environment.

3631 KAUFMANN, B. P. & MCDONALD, M. R.
The nature of the changes effected in chromosomal materials by the chelating agent EDTA.
Proc. nat. Acad. Sci. USA 1957 : **43** : 262–70.

Experiments on *Drosophila* and *Allium cepa* provided evidence that ethylenediamine tetraacetic acid (EDTA) causes deformation of the chromosomes by altering the colloidal properties of the structural nucleoproteins. RNA was involved in the deformational changes. It is concluded that such changes depend upon modification of the general ionic environment of the cell and not merely on the removal of specific divalent cations from the chromosome.

3632 SIRKS, M. J.
Het gene-begrip. (**The gene concept**).
Vakbl. Biol. 1957 : **37** : 65–77.

Work carried out since 1940 which has had a modifying effect on earlier views of the nature of the gene is reviewed, special reference being made to position effects, pseudoallelism and interallelic crossing over (cf. *PBA*, XXVI, Abst. 1952).

3633 WESTERGAARD, M.
Chemical mutagenesis in relation to the concept of the gene.
Experientia 1957 : **13** : 224–34.

It is suggested that the gene should be regarded as carrying genetic information and operating on three levels, (1) as a self-reproducing information system, (2) as a translation system which decodes the information and transmits it to (3) a receptor system. Changes may occur at any level, resulting in a change in the phenotype. It is tentatively suggested that cytoplasmic mutations, for example 'petite' yeast colonies, are the result of alterations in the translation system and, since there is no feed-back mechanism to the information system, they are not inherited. Mutations proper occur in the information system, all changes of this kind being located in the chromosomes. The various tests employed to investigate the types and rates of mutation are then discussed, particular emphasis being laid on the study of back mutations in *Neurospora*. All the chemicals known to cause back mutations are unstable and highly reactive, although unrelated chemically, whereas many substances causing chromosome breakage but unable to cause back mutations are stable compounds, including some peroxides which may occur naturally. It is suggested that antimutagens, such as catalase

and organic peroxidases, act as a buffer system counteracting some mutagens, especially the peroxides. Thus many chemicals act indirectly as mutagens by inhibiting those enzymes which also function as antimutagens. It is concluded that recent studies of chemical mutagenesis have resulted in the breakdown of the concept of the gene as a unit of function and of mutation, although new data on subgenic mutations and recombinations are not necessarily inconsistent with the concept of the functional integrity of the gene. In conclusion mention is made of recent studies of genetic mechanisms on the molecular level.

3634 SAGAN, C.
Radiation and the origin of the gene.
Evolution, NY 1957 : **11** : 40–55.

"It is suggested that solar ultraviolet radiation penetrated through the primitive terrestrial atmosphere to the surface of the waters. The existence of loci of phosphorous-organic concentration is likely, and ultraviolet-activated ring structures may have transferred their energy to synthesize high-energy phosphate bonds. Small amounts of proteins produced by pyrosynthesis or by radiation-induced polymerization would have provided the enzymatic priming required for utilization of ATP [adenosine triphosphate], and the large-scale production of biomolecules. The differential survival of polymers over nonpolymers is indicated by polymeric resistance to ultraviolet photolysis.

"It is proposed that nucleic acids of proteins possess certain unique properties which were ideally suited for biogenesis. The origin of polynucleotides (protoDNA) was a major turning point, since reproduction and biological evolution were now possible. Hydrogen bond lysis and protoDNA reproduction may have been radiation-induced. The resulting, evolving nucleoprotein, situated in a dilute medium of organic matter, is suggested to be the first living thing, a free-living naked gene."

[Author's summary].

Genetic mechanisms: structure and function.
Cold Spring Harbor symposia on quantitative biology. New York, 1956 : **21** : Pp. 392.

The contributions most likely to be of interest to plant geneticists are abstracted below. In addition to the four sections indicated the symposium included a fifth entitled Developmental level, dealing with investigations on *Drosophila* and other animals.

I. Chemical level

3635 *Caspersson, T. Quantitative cytochemical determinations on endonuclear structures.* (*pp. 1–18*).

A description is given of recent technical developments made by the author in the field of spectromicrography (cf. p. 589).

3636 *Kanazir, D. & Errera, M. Alterations of intracellular deoxyribonucleic acid and their biological consequence.* (*pp 19–29*).

The effects of ultraviolet light on *Escherichia coli* 'B' and 'B/r' and on lysates of *Micrococcus lysodeikticus* were investigated. Ultraviolet light does not inhibit ribonucleic-acid or protein synthesis but does block DNA synthesis. This blocking is accompanied by the accumulation of deoxyribonucleotides, deoxyribonucleosides and energy-rich phosphate compounds.

3637 *Bendich, A., Pahl, H. B. & Beiser, S. M. Chromatographic fractionation of deoxyribonucleic acids with special emphasis on the transforming factor of pneumococcus.* (*pp. 31–48*).

Studies on chromatographic fractionation of DNA from diverse sources by means of a base-substituted cellulose column are reported. It was observed that considerable departures from the unity ratios for adenine/thymine and guanine/cytosine postulated by Watson and Crick (cf. *PBA*, XXIV, Abst. 57 and XXV, p. 452) occurred in some of the fractions. It was also noted that many of the fractions of pneumococcal transforming DNA had transforming activity. These findings cast some doubt on the hypothesis that DNA molecules need to be replicated exactly.

3638 *Mirsky, A. E., Osawa, S. & Allfrey, V. G. The nucleus as a site of biochemical activity.* (*pp. 49–73*).

Experiments on the biochemical activity of isolated nuclei from calf thymus are reported. Such nuclei can incorporate isotope-labelled aminoacids into the nuclear protein. This uptake proceeds in the presence of the DNA normally present, DNA from other sources, degraded DNA and RNA. The dinucleotides tested were not capable of effecting incorporation but there were indications that trinucleotides might be effective. It was shown too that isolated nuclei are capable of phosphorylating nucleotide monophosphates to the energy-rich triphosphate forms.

3639 *Wilkins, M. H. F. Physical studies of the molecular structure of deoxyribose nucleic acid and nucleoprotein.* (*pp. 75–90*).

The following topics are reviewed: the physical

evidence for the twin-helical structure of DNA proposed by Watson and Crick, the possible ways in which such a molecule could function as a template, replication of the molecule, and the structure of nucleoprotamines and nucleohistones.

3640 *Hershey, A. D. & Burgi, E. Genetic significance of the transfer of nucleic acid from parental to offspring phage.* (*pp. 91–101*).

Levinthal has suggested that bacteriophage DNA consists of two kinds: (1) a large genetically active piece and (2) a number of small pieces of uncertain function (cf. Abst. 85). The authors review this hypothesis in the light of recent experiments on radiographs of phage particles labelled with P^{32}, the distribution of P^{32}-labelled phage particles subject to radioactive decay, transmissible lesions induced by ultraviolet light and linkage between P^{32} and genetic markers.

II. Genic level

3641 *Streisinger, G. & Franklin, N. C. Mutation and recombination at the host range genetic region of phage T2.* (*pp. 103–11*).

Ability of T2 to absorb mutant B/2 of *Escherichia coli* is lost by reversion of the *h* to h^+ condition as the result of any one of several mutational events within a single region. Some h^+ strains have an increased sensitivity to temperature. The *h* region therefore shows some resemblance to systems controlling the production of enzymes in other organisms, notably locus *td* in *Neurospora*. The various h^+ mutations have been mapped by means of data from three-factor crosses. The closest sites in the *h* region are 0·004 recombination units apart, the next closest 0·02 units apart. These estimates are in agreement with Benzer's hypothesis that the elements separable by recombination are not larger than nucleotide pairs (cf. *PBA*, XXVI, Abst. 977). The total length of the *h* region is about 2 units, as compared to 4 units for each of the two sections of the rII region in T4, as reported by Benzer. Analysis of alterations from the h^+ to *h* condition indicated that the mutations occurred at or very close to the sites of the original change from *h* to h^+. Some of the h^+ sites had configurations which were more mutable than any of the configurations responsible for the *h* phenotype. The *h* region was found to act as a single functional unit, since the *h* phenotype could only be produced if all the sites within the region were in the *h* state (cf. Abst. 25). Loci not closely linked with *h* but controlling specificity of absorption have been discovered; their mode of action has not yet been elucidated. Since differences at *h* are believed to control disparities in the protein of the phage tail, it may eventually be possible to study a point-by-point correspondence between genetic changes at *h* and structural changes in the protein product.

3642 *Demerec, M. A comparative study of certain gene loci in* Salmonella. (*pp. 113–21*).

The author surveys recent research carried out on auxotrophic mutants of *S. typhimurium* by himself and his colleagues at the Carnegie Institution of Washington by means of the transduction technique. In addition to work already reported (cf. Abst. 2468 and p. 594), some unpublished results are discussed. At many of the 42 loci so far identified nonidentical alleles may be found, a considerable degree of differentiation occurring among alleles at any one locus with respect to the nutritional requirements they control. In the case of locus *athA*, in which sites of nine alleles for requirements of adenine and thiamine have been identified, polarity in arrangement has been found, with the more stable alleles at the centre of the locus and the less stable peripherally situated. Analysis of locus *cysB*, at which two groups of alleles occur, one determining cysteine requirement and the other a deficiency satisfied by either cysteine or SO_3 compounds, has indicated that the sites of the different groups are not distributed at random but that members of one group tend to be clustered, with intermixing of the assemblages of members from the two groups. Multiple-site mutants have also been identified. These fail to produce recombinants with single-site mutants at the same locus, involve a well-defined region of the chromosome, usually occur with a lower frequency than single-site mutants at the same locus, fail to revert to prototrophy and exhibit a lower frequency of crossing over with markers at adjacent loci than single-site mutants at the locus in question. Multiple-site mutants may be due to deletion.

3643 *Witkin, E. M. Time, temperature, and protein synthesis: a study of ultraviolet-induced mutation in bacteria.* (*pp. 123–40*).

The maximum yield of prototrophs from one half of an ultraviolet-treated suspension of a tryptophane-requiring strain of *S. typhimurium* was produced only on plates sufficiently enriched with nutrient broth to promote about six residual divisions, whereas the maximum yield

of prototrophs arising as the result of transduction by phage derived from the other half of the irradiated suspension was obtained after only one residual division. It was concluded that phenotypic lag, irregularity in the growth pattern of irradiated cells and nuclear segregation were not primarily responsible for the delayed appearance of ultraviolet-induced prototrophs. A comparison was made of the rate of increase in the number of newly-induced prototrophs in clones developing from irradiated auxotrophs with the growth rate of a previously-isolated stock of the induced prototroph on the same selective medium with and without ultraviolet-killed auxotrophs. No support was found for the hypothesis that (1) most of the induced mutations occur after a delay of several generations and (2) the potential mutant cell is delayed in its onset of multiplication. Further experiments revealed that the yield of induced prototrophs was determined irreversibly by the amount of nutrient broth in the culture medium during the first hour of postirradiation incubation at 37° C. and was independent of the number of residual divisions. The active component of the nutrient broth proved to be the aminoacid fraction. From various studies of growth it was inferred that the yield of induced prototrophs is proportional to the rate of protein synthesis during the first hour of post-irradiation incubation, when protein synthesis is limiting growth. Temperature during post-irradiation incubation had a marked effect upon the frequency of induced prototrophs but little influence upon survival. The number of prototrophs ranged from none at 45° C. to a frequency two or three times higher at 24° C. than that at 37° C. The period of susceptibility to the influence of temperature was about one-third of the lag phase and coincided approximately with the periods of susceptibility to the effects of chloroamphenicol and low aminoacid concentration. A marked synergistic effect upon prototroph frequency was obtained when a short period of incubation at 37° or 45° C. was followed by incubation at lower temperatures. The implications of these results are discussed in relation to theories of mutagenesis.

3644 *Wollman, E.-L., Jacob, F. & Hayes, W. Conjugation and genetic recombination in* Escherichia coli *K-12.* (*pp. 141–62*).

Chiefly with reference to work already published, the authors discuss their investigations on (1) conjugation of Hfr or F^+ with F^- cells, from the first encounter between donor and recipient to the completion of partial and oriented genetic transfer, and (2) the formation of recombinants (cf. Abst. 2447).

Since transduction, transformation and conjugation in bacteria all involve transfer of only a fragment of the donor genome, "meromixis" is proposed as a common term for these processes.

3645 *Bonner, D. M. The genetic unit.* (*pp. 163–70*).

The problem of the nature of the genetic unit is discussed on the basis of the research of the writer and his collaborators on *Neurospora*. Allelic mutants at locus *td* for tryptophane requirement are not all alike immunochemically, in response to the presence of suppressor mutations or in sensitivity to temperature (cf. *PBA*, XXVI, Absts. 950 and 2031). The region controlling tryptophane synthetase is therefore functionally complex. Analysis of the locus in terms of genetic complexity has however been severely handicapped by the sterility of many of the crosses between mutants. Investigation of locus *q* for niacin requirement has indicated that prototrophic progeny arise in the absence of crossing over, possibly as the result of removal of material which was associated with *q* and inactivated or altered the normal functioning of *q* alleles (cf. *PBA*, XXVI, Absts. 944 and 3045). The genetic material controlling the formation of a specific enzyme may therefore be an indivisible unit, at any rate in *Neurospora*. It is also pointed out that in this organism linkage of loci determining sequential biosynthetic steps has not been detected as in *Salmonella* and *Escherichia*; lack of recognition of such linkage may however reflect inadequacy of biochemical knowledge.

3646 *Pontecorvo, G. Allelism.* (*pp. 171–74*).

Mainly with reference to published work on *Aspergillus* general concepts on the demarcation of genetic material are appraised. It is suggested that at present the model in which a minute chromosome section is envisaged as made up of a series of linearly-arranged mutational sites capable of undergoing crossing over with one another may be the most valuable, the term gene being reserved for cruder levels of analysis and to denote a functional integration of sites (cf. Abst. 42). Recent investigations by Calef have however indicated that the test of non-complementarity effect as a means of detecting sites of recessive mutations belonging to a single locus is not necessarily decisive (cf. Abst. 1033). It is therefore possible that at least in some cases transition between sites in one system of integration may be gradual. The author further

suggests that although a tendency to close linkage between genes with similar or related action may be discerned in various organisms, many cases are known in which such linkage does not occur.

3647 *Roman, H. Studies of gene mutation in* Saccharomyces. (*pp. 175–85*).

By means of data on the occurrence of revertant diploids in heteroallelic combinations between adenine-requiring haploid mutants, 73 out of 83 mutations at the loci *Ad*1 to *Ad*7 proved to be distinct. In attempting to explain the origin of such reversions, the following findings had to be taken into consideration: (1) nonreciprocal recombination without concurrent recombination of distal markers, (2) enhancement of the frequency of reversion after sporulation as the consequence of meiosis, (3) recovery of each of two *Ad* alleles from revertants and (4) the occasional occurrence of revertants homozygous for adenine independence. These phenomena are interpreted in terms of a model of either alternative replication involving sister and non-sister chromatids or migration of genic elements from one chromosome to its homologue. In an addendum the author also suggests that irregular segregation ratios for alleles at an *Ad* locus may be more satisfactorily explained by either of the above hypotheses than by gene conversion.

III. Chromosomal level

3648 *McClintock, B. Controlling elements and the gene.* (*pp. 197–216*).

The following aspects of controlling elements such as *Ac*, *Ds* and *Spm* in maize are discussed in detail in order to supplement the information surveyed in a recent review (cf. Abst. 2467); distinctions between controlling and gene elements; methods of detecting transposition; structure; mode of transposition; positions in the chromosome complement at which controlling elements may be inserted; and modification of gene action.

3649 *Kaufmann, B. P. & McDonald, M. R. Organization of the chromosome.* (*pp. 233–46*).

The authors discuss investigations carried out at the Carnegie Institution of Washington on (1) the structure of chromosomes as revealed by the electron microscope (cf. Abst. 1136) and (2) the effects of ethylenediamine on chromosomal structure and on the frequency of crossing over (cf. Abst. 3631).

3650 *Levine, R. P. Chromosome organization and gene recombination.* (*pp. 247–56*).

The following aspects of crossing over are analysed in a comprehensive survey of the hypotheses put forward on the basis of work on lower and higher organisms: (1) the role of pairing and chiasmata, (2) the time of crossing over in terms of chromosome organization and (3) possible mechanisms of crossing over. Two approaches may be made to the third problem. In one crossing over is regarded as occurring in a chromosome which is neatly separated into cross-over and non-cross-over units at the molecular level. In the second crossing over is explicable as a submolecular event, as suggested by studies of recombination in phage, *Aspergillus* and *Drosophila*. If the latter is the correct interpretation, as the author is inclined to believe, crossing over may occur either during or after DNA replication. He concludes with an outline of his current experiments on *Chlamydomonas reinhardi* to determine the time relationship between DNA synthesis and crossing over, with the aid of temperature treatments which increase the frequency of crossing over. According to results so far obtained, DNA synthesis and crossing over occur within the same 24-hour period.

IV. Cellular level

3651 *Gay, H. Nucleocytoplasmic relations in* Drosophila. (pp. *257–69*).

It is suggested that the formation of detachable nuclear-membrane vesicles detected in salivary-gland cells by means of the electron microscope is a manifestation of the transfer of materials essential for synthetic activities from specific regions of the chromosomes into the cytosome. The detachment of such nuclear-membrane segments may represent a mode of production of plasmagenes.

3652 *Schultz, J. The relation of the heterochromatic chromosome regions to the nucleic acids of the cell.* (*pp. 307–28*).

Experiments on *Drosophila* indicated that nucleic-acid synthesis in gametogenesis and the imaginal tissues depended upon the activity of heterochromatin.

3653 *Brachet, J. & Chantrenne, H. The function of the nucleus in the synthesis of cytoplasmic proteins.* (*pp. 329–37*).

In neither *Acetabularia mediterranea* nor *Amoeba proteus* was the nucleus the exclusive site of synthesis of cytoplasmic proteins and RNA.

3654 PETROV, D. F.
(A contribution to the problem of the material basis of heredity).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 31–46. [Russian].

Factual material demonstrating the constancy of the chromosomes and their role in the transmission of hereditary characters is cited, the citations including extracts from the writings of Mičurin, Koljcov who in 1938 put forward the concept of the chromosome as a giant molecule, Navašin, Levickiĭ, Palladin, Dubinin and other Russian workers. The connexion between known genes and certain enzymes is illustrated by the work with biochemical mutants of *Neurospora* and other organisms in the USA and with bacteria by the writer and collaborators in the Soviet Union and the view is expressed that the individual genes are all necessary, separately and as a whole, for the correct functioning of a given organism. The views of Lamarck and others are dismissed as idealistic and those of Goldschmidt (cf. *PBA*, XIII, p. 171), more on the basis of the objects of the Silliman bequest than of the contents of his writings, suffer the same fate.

3655 ALFOLDI, L., JACOB, F. & WOLLMAN, E. L.
Zygose létale dans les croisements entre souches colicinogènes et non colicinogènes d'*Escherichia coli*. **(Lethal zygosis in crosses between colicinogenic and non colicinogenic strains of *E. coli*).**
CR Acad. Sci., Paris 1957 : **244** : 2974–77.

Transference of the colicinogenic character (col^+) to the F^- strain occurred in the crosses F^+col^+ x F^-col^- and Hfr col^+ x F^-col^-, but in the crosses F^+col^- x F^-col^+ and Hfr col^- x F^-col^+ no transference of col characters to the opposite strain occurred. The character col^+ was independent of other characters studied. Studies of the last-mentioned cross indicated that conjugation between col^- donor bacteria and col^+ receptor forms, both types being resistant to the colicin in question, leads to the death of about 90% of the zygotes formed.

3656 FRÉDÉRICQ, P.
Résistance et immunité aux colicines. **(Resistance and immunity to colicins).**
CR Soc. Biol., Paris 1957 : **150** : 1514–17.

Transduction of the colicinogenic character to *Escherichia coli* strain K12, which is non-colicinogenic, gave transduced colicinogenic forms, resistant to the colicin they produced, but not to any other colicin. Such strains were thus unlike resistant mutants selected by exposure to any one colicin; these are immune to other colicins of the same group since they lack the appropriate colicin receptor. It is suggested that colicins may be regarded as bacterial viruses, distinct from bacteriophages.

3657 FRÉDÉRICQ, P.
Recherches sur le transfert génétique des propriétés lysogènes par croisement des souches *Escherichia coli* K.12 et B. **(Investigations on the genetic transference of lysogenic properties by crossing strains K12 and B of *E. coli*).**
CR Soc. Biol., Paris 1957 : **150** : 2035–39.

In crosses of the above two strains, the lysogenic character of K12 cannot be transmitted to B but the nonlysogenic character of B may be transmitted to K12. The nonsusceptibility of strain B to phage λ appears to result from the absence of an appropriate receptor in B. The phage is able to multiply in B if it is introduced by means of recombination and some recombinants may inherit the susceptibility to λ of K12 while retaining the B genotype.

3658 LEDERBERG, J.
Linear inheritance in transductional clones.
Genetics 1956 : **41** : 845–71.

As defined by the author, a line corresponds to a sequence of unequal fissions, at each stage of which only one product propagates the line. The linear transmission of motility and of trait E (the generation of many motile lines) found in clones derived from transduced cells of *Salmonella* is discussed chiefly with reference to the possible role of a nonreplicating exogenote, or nondividing phenotypic residue, possibly a flagellum, in such inheritance. The author also discusses analogous examples of asymmetrical division of the cell in other organisms and the concept of linear inheritance in relation to the hypothesis of unequal chromosome division at mitosis, to the interpretation of morphogenetic differentation and aging and to the semantics of the term particle in biology.

3659 RIZET, G.
Les modifications qui conduisent à la sénescence chez *Podospora* sont-elles de nature cytoplasmique? **(Are the modifications which lead to senescence in *Podospora* of a cytoplasmic nature ?)**
CR Acad. Sci. Paris 1957 : **244** : 663–65.

Crosses between a young female culture and male cultures of any age gave progeny with normal longevity, but where the female parent was senescent two types of perithecia were produced: (*a*) those yielding asci with ascospores

which gave normal cultures and (*b*) those yielding asci with ascospores which gave cultures showing senescence. Most crosses of the latter type gave 0–10% of (*b*) perithecia, but where the normal longevity of the parents was low the proportion of (*b*) sometimes reached 80–90%. No intra-ascal segregation was observed, and it is suggested that senescence is cytoplasmically determined.

3660 Michaelis, P.
Über die Vererbung von Plastidenmerkmalen. (**On the inheritance of plastid characters**).
Protoplasma 1957 : **48** : 403–18.

Detailed studies of numerous variegated *Epilobium* plants obtained by means of treatment with radioactive isotopes allowed the following variegation types to be distinguished: (1) relatively simple patterns which may have arisen through somatic mutation of nuclear genes or unequal distribution of plasmagenes during cell division and (2) more complicated patterns arising through plasmon recombination (cf. Abst. 1050). Within the second group different patterns are produced according to whether the hereditary factors are carried by the plastids (endogenous determination of plastid type) or by other cytoplasmic inclusions (exogenous determination). Certain anomalous cell arrangements are attributed to the diffusion from cell to cell of substances affecting plastid characters.

3661 Stocker, B. A. D. & Quadling, C.
Bacterial motility: an analysis of variation amongst cells of identical genotype sharing a common "uniform" environment.
Heredity 1957 : **11** : 154–55. (Abst.)

It is suggested that the appearance of individuals which acquire a transient ability to develop flagella in a genetically uniform, nonmotile clone of *Salmonella* grown in a uniform environment may be attributed to minor environmental differences which may occur within a uniform liquid. Knowledge of genotype, parental phenotype and environment may permit the prediction, for an individual, of the probability of a particular phenotype (cf. Abst. 1051).

3662 Bettini, T. M.
Allelia, frequenza genica, omozigosi ed eterozigosi. (**Allely, gene frequency, homozygosis and heterozygosis**).
Ann. Fac. Agr. Portici 1954–1955 (1956) : **21** : 248–49.

The extension of the Hardy-Weinberg Law to loci with multiple allelomorphs is briefly described.

3663 Opsahl, B.
En biometrisk metode i planteforedlingen. (**A biometrical method in plant breeding**).
Nord. JordbrForskn. 1956 : **38** : 307–09.

An outline of the method of diallel analysis referred to in *PBA*, XXV, Absts. 2624–5 is presented.

3664 Matzinger, D. F. & Kempthorne, O.
The modified diallel table with partial inbreeding and interactions with environment.
Genetics 1956 : **41** : 822–33.

"The theoretical covariances between full-sibs and half-sibs under random mating in an arbitrarily inbred population are presented for the case of arbitrary numbers of alleles and loci, and arbitrary epistacy.

"The results are applied to the modified diallel cross table in which the parents are of the same known degree of inbreeding. The theoretical relationships between general combining ability and specific combining ability variances, and the components of genotypic variance in the random mating population are obtained.

"The procedures for analysis and interpretation of modified diallel crosses replicated over locations and years are presented."

[Authors' summary].

3665 Wittmann, H. G.
Untersuchungen über die Bedeutung von Temperatur und genetischer Konstitution für die Mutabilität von Bakteriophagen. (**Investigations on the importance of temperature and genetic constitution for the mutability of bacteriophages**).
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 128–44.

Experiments carried out with phages T2, T2*r* and T7 showed no difference in the mutation rate of the *h* locus at temperatures ranging from 20 to 37°C.; nor was the mutation rate influenced by the distance of the *h* locus from *r*, all *r* strains investigated having the same mutation rate for h^+ to *h*.

3666 Fincham, J. R. S. & Boylen, J. B.
***Neurospora crassa* mutants lacking argininosuccinase.**
J. gen. Microbiol. 1957 : **16** : 438–48.

Four mutants requiring arginine but unable to utilize citrulline proved to be blocked in the conversion of argininosuccinic acid to arginine.

3667 Newmeyer, D.
Arginine synthesis in *Neurospora crassa*: genetic studies.
J. gen. Microbiol. 1957 : **16** : 449–62.
Five of the nine single-gene mutants studied belonged to linkage group I and were blocked in the first step of the conversion of citrulline into arginine. The remaining four belonged to linkage group VII and were blocked in the second step (cf. Abst. 3666). Heterocaryon tests between mutants of the same group gave negative results. Intragroup crosses were almost sterile. Crosses within the first group did not result in any wild-type progeny. Mapping tests of four mutants in this group were indicative of allelism or close linkage. All crosses between mutants in the second group gave a high proportion of wild-type progeny. Two of these mutants were studied in detail and appeared to be pseudoallelic.

3668 Fincham, J. R. S.
A modified glutamic acid dehydrogenase as a result of gene mutation in *Neurospora crassa*.
Biochem. J. 1957 : **65** : 721–28.
A secondary mutant derived from an ultraviolet-induced mutant lacking detectable glutamic-acid dehydrogenase produced a glutamic-acid dehydrogenase which, unlike the enzyme synthesized by the wild type, was capable of undergoing reversible activation.

3669 Giles, N. H., Partridge, C. W. H. & Nelson, N. J.
The genetic control of adenylosuccinase in *Neurospora*.
Proc. nat. Acad. Sci. USA 1957 : **43** : 305–17; and Science 1957 : **125** : p. 747. (Abst.)
Twenty-one adenine-requiring mutants, which arose as the result of radiation-induced mutation at locus *ad*–4 in linkage group III, were deficient in adenylosuccinase activity, this enzyme being responsible for splitting adenosine monophosphate succinate to adenosine monophosphate. They are referred to as belonging to group F (cf. Abst. 1103). Most of the mutants showed a complete lack of adenylosuccinase activity. One was temperature-sensitive, being prototrophic at lower temperatures; the adenylosuccinase it produced was much more thermolabile than that of the wild type. Adenine-independent segregates arising with a low frequency in some crosses among the mutants were usually pseudowilds. Certain of the F mutants were capable of reversion to adenine independence, either spontaneously or as the result of ultraviolet irradiation, but in none was the level of adenylosuccinase activity restored to that in the wild type. The reversal showed quantitative differences in adenylosuccinase activity. Certain combinations between pairs of mutants formed adenine-independent heterocaryons which synthesized adenosine monophosphate in a similar manner to the wild type; possible reasons for this unexpected complementation are discussed.

3670 Strauss, B. S.
Oxalacetic carboxylase deficiency of the succinate-requiring mutants of *Neurospora crassa*.
J. biol. Chem. 1957 : **225** : 535–44.
Evidence has been obtained suggesting that the dicarboxylic-acid deficiency in single-gene *suc* mutants results from disturbance in an oxalacetic-acid carboxylase system (cf. *PBA*, XXVI, Abst. 948).

3671 Tanami, Y.
Frequency distribution of host-range mutants among T2 phage infected bacteria.
J. Bact. 1957 : **73** : 513–15.
"The frequency distribution of the host-range mutant phages of T2, phenotype h^e, among individual bacteria was investigated for the purpose of analyzing the mutation process and reproduction rate of intracellular virus particles. The distribution of the mutant clones with respect to their size was clearly an exponential type indicating that the replication of the virus genes proceeds in such a way that replicas themselves may serve as patterns for additional replications." [Author's summary].

3672 Northrop, J. H.
Adaptation of *Bacillus megatherium* to terramycin (oxytetracycline).
J. gen. Physiol. 1957 : **40** : 547–63.
Adaptation of *B. megaterium* to terramycin was due to the overgrowth of a few resistant mutants present in the culture of sensitive cells prior to addition of the antibiotic.

3673 Alikhanian, S. I. & Iljina, T. S.
Actinophage as a mutagenic factor.
Nature, Lond. 1957 : **179** : p. 784.
The rate of mutation induced in *Actinomyces olivaceus* by actinophage isolated from *A. globisporus* var. *streptomycini* was many times greater than that resulting from ultraviolet treatment.

3674 Berducou, J.
Mécanisme de la formation des chancres à Nectria du pommier. Rôle de l'acide indole-β-acétique dans la biologie de *Nectria galligena* Bres. et de *Nectria cinnabarina* Tode. (Mechanism of the formation of Nectria cankers on the apple tree. Role of β-indoleacetic acid in the biology of *N. galligena* Bres. and *N. cinnabarina* Tode).
Ann. Éc. nat. supér. agron., Toulouse 1956 : **4** : No. 2 : Pp. 179.

In the course of this investigation, it was observed that β-indoleacetic acid induced two types of hereditary change in *N. galligena*, affecting morphological and biochemical characteristics. One type appeared to represent true mutation; the other included variants that persisted on diluted Knop media but reverted to normal on other media. These latter forms are regarded as examples of modulation.

3675 Lester, G. & Bonner, D. M.
Genetic control of raffinose utilization in *Escherichia coli*.
J. Bact. 1957 : **73** : 544–51.

Strains able to utilize raffinose as a sole carbon source have been obtained from auxotrophs of *E. coli* strain K–12, which do not use raffinose, by ultra violet irradiation. The phenotypic expression of raffinose utilization is dependent on the presence of independent genes for α-galactosidase and for constitutive β-galactosidase.

3676 Bernstein, A.
Multiplicity reactivation of ultraviolet-irradiated Vi-phage II of *Salmonella typhi*.
Virology 1957 : **3** : 286–98.

"Vi-phage II of *Salmonella typhi* which has been inactivated by exposure to ultraviolet light can be reactivated by multiple infection of a sensitive host. The degree of reactivation observed agrees with that predicted by the recombinational hypothesis of multiplicity reactivation of Luria (1947). Analysis of the experimental data suggests that there are about four ultraviolet sensitive units in this phage." (Cf. *PBA*, XVIII, Abst. 769). [Author's summary].

3677 Newcombe, H. B.
Mutagenic actions of cold and X-rays in *Streptomyces*.
Radiation Res. 1956 : **5** : 382–89.

Sensitivity to mutation during storage at low temperatures was found to rise to a high level in germinating spores after four hours of incubation whereas sensitivity to X-ray induced mutation reaches a maximum after three to three and a half hours of incubation and decreases again after five hours. No increase in the proportion of mutants was found with increased time of exposure to cold, the response apparently being determined by the stage reached by the spores at the time of exposure. The response to combined X-irradiation and cold treatment was found to be only partially additive, suggesting a degree of similarity between the mechanisms involved. 24-hour microcolonies from X-irradiated spores, when stored in the cold, showed a decline in X-ray mutagenesis followed later by an increase in cold-induced mutagenesis. It is suggested that the two kinds of change proceed simultaneously but independently. Cell death increased in both cases with increasing mutation frequency, a slightly higher rate of killing being observed in the case of cold treatment.

3678 Dubinin, N. P.
(Plant breeding by radiation).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1–19. [Russian].

After pointing out the practical advantages that have accrued from the application of such genetic principles as crossing inbred lines and the production of polyploids, a review is given of recent attainments in the induction of mutants by irradiation; mention is made of mutants with improved strength of straw, earliness, protein and oil content, disease resistance, yield or quality, all produced in Sweden. Other examples are the greatly improved capacities for antibiotic production of a number of microorganisms produced by radiation, some of them in the USSR; groundnuts with increased yield and disease resistance, oats with increased resistance to rust and to *Helminthosporium sativum*, Huron oats with greater standing capacity, rust resistance and yield and others are mentioned from the USA and the importance that is attached to this line of work in the USA and Canada is emphasized. Attention is called to the importance of oxygen and of various environmental factors and the kind of radiation in controlling the type of mutants obtained and a parallel is drawn with the use of chemicals, the different type of mutants resulting from the use of nebularin and of alkylating substances being instanced. Certain future possibilities are suggested, such as the production of androgenous forms by sterilizing the egg cell with

radiation or the induction of apomicts with perpetual heterosis.

3679 Mundry, K.-W.
Zur Frage des Einflusses von Röntgen- und UV-Strahlen auf die Mutationsrate des Tabakmosaikvirus nach Bestrahlung reiner Präparate. **(The question of the influence of X and ultraviolet rays on the mutation rate of tobacco mosaic virus after irradiation of pure preparations).**
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 115–27.
Solutions of the virus irradiated with hard X rays or with ultraviolet rays when compared with unirradiated solutions brought to the same degree of infectivity by dilution showed no increase in mutation rate. The apparent increase observed by certain other workers is ascribed to the removal of competition between necrotic and systemic forms of the virus by dilution, a conclusion which was supported by experiments with artificial mixtures of such strains.

3680 Sparrow, A. H. & Pond, V.
The relationship between dose rate and somatic mutation in *Antirrhinum majus* exposed to chronic gamma-irradiation.
Radiation Res. 1956 : **5** : p. 596. (Abst.).
Two closely related clonal lines exposed to various levels of chronic γ-irradiation at Brookhaven were found to show a higher mutation rate when scored in October than when scored in July or August but evidence indicates that this effect is not merely the result of longer exposure time. One clone showed a disproportionately high rate of induced mutation at the lowest levels of radiation, while the other showed an almost linear dose-action curve.

3681 Arlett, C. F.
Induction of cytoplasmic mutations in *Aspergillus nidulans*.
Nature, Lond. 1957 : **179** : 1250–51.
Cytoplasmic mutations, identified by Jinks's heterocaryon test, were induced by ultraviolet irradiation or acriflavine. One of the ultraviolet-induced mutants was investigated in detail. Segregation among its asexual progenies with respect to growth characteristics was explained by assuming that mutation did not affect all of the representatives of a cytoplasmic component in the original asexual spore.

3682 Krasilnikov [Krasiljnikov], N. A.
Variabilitatea indusă la bacterii. **(Induced variability in bacteria).**
An. Romîno-Soviet. : Ser. Biol. : 1956 : **10** : No. 3 : 5–20.
This article is a Rumanian version of that summarized in *PBA*, XXVI, Abst. 2014.

3683 Mathon, C. C.
Daniel, Mitchourine et Burbank. **(Daniel, Mičurin and Burbank).**
J. Agric. trop. Bot. appl. 1956 : **3** : 792–808.
An appreciative review is given of Daniel's work on graft hybridization. Comparisons are drawn between the views of Daniel, Mičurin and Burbank.

3684 Maton, K.-Š. [Mathon, C.-C.]
(Lucien Daniel and his theory).
Agrobiologja (Agrobiology) 1956 : No. 6 : 3–15. [Russian].
This biography of Daniel, presented on the occasion of the centenary of his birth, refers to his experiments on vegetative hybridization with *Helianthus* spp.

3685 Goldschmidt, R. B.
Problematics of the phenomenon of phenocopy.
J. Madras Univ. 1957 : **27** : 17–24.
From an examination of the behaviour characteristic of artificially-induced phenocopies in *Drosophila* and other organisms the author postulates that all phenocopies may arise through enhancement of mutations with low penetrance.

3686 Lavrik, P. I.
(An unusual form of criticism).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 107–14. [Russian].
The author refers to the criticism of his work by Gončarik (cf. *PBA*, XXVI, Abst. 844), and quotes chapter and verse for his references to Mičurin. He reiterates his belief that hereditary influences of the scion on the stock occur, while those of the stock on the scion are only of a temporary nature.

3687 Manoliu, M.
100 de ani de la naşterea lui I. V. Miciurin. **(100 years since the birth of I. V. Mičurin).**
An. Romîno-Soviet : Ser. Agric. : 1955 : **9** : No. 6 : 5–15.
Mičurin's life and work are reviewed and the development of his theories by Lysenko described. The spread of Mičurinism outside the

USSR is briefly mentioned and an account is then given of recent Rumanian plant breeding work which, it is stated, is now based on Mičurin's principles.

3688 Skaar, P. D., Richter, A. & Lederbert, J.
Correlated selection for motility and sex-incompatibility in *Escherichia coli*.
Proc. nat. Acad. Sci. USA 1957 : **43** : 329–33.

F^+ cultures undergoing selection for high motility frequently produce F^- clones. It is suggested that F^- mutation is associated with an augmentation of motility, which is superimposed upon a polygenic control of motility.

EVOLUTION

3689 Hohlov, S. S.
Problema speciaţiei în lucrările lui I. V. Miciurin. (**The problem of speciation in the works of I. V. Mičurin**).
An. Romîno-Soviet. : Ser. Biol. : 1956 : **10** : No. 2 : 45–59.

A Rumanian version of the article summarized in *PBA*, XXVI, Abst. 3000 is given.

3690 Cannon, H. G.
What Lamarck really said.
Proc. Linn. Soc. Lond. 1957 : **168** : 70–87.

Lamarck's evolutionary theories, which the author believes to have been misrepresented by most later biologists, are expounded. In particular it is pointed out that Lamarck's use of the term *besoin*, usually translated as *need*, expressly excludes conscious volition. Reasons why Darwin thought fit to ignore references to Lamarck's writings are also considered.

3691 Tachtadżjan, A. L.
Pochodzenie okrytonasiennych. (**The origin of the angiosperms**).
Acta Soc. Bot. Polon. 1957 : **26** : 1–15.

The evolution of angiosperms from gymnosperm ancestors by means of rapid fixation of random mutations in small isolated or partly isolated populations, probably situated in mountainous areas providing variable conditions, is postulated. It is further suggested that this evolutionary process favoured the development of neotenous forms which, although of simplified phenotype, retained their genetic complexity and potentiality for further evolution. Morphological features in angiosperms which may be interpreted on the basis of a neotenous origin are briefly discussed.

3692 Zelikman, A. L.
(The question of C. Darwin's views on "leaps" in the history of evolution of organic life).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1957 : No. 1 : 89–95. [Russian].

The claim by Lysenko and his followers that Darwin envisaged that evolution involved quantitative but not qualitative changes is shown to be unjustified.

3693 Li, H.-L.
The evolutionary significance of the endosperm and its bearing on the origin of angiosperms.
J. Wash. Acad. Sci. 1957 : **47** : 33–38.

After pointing out that the normal chromosome ratio, in an angiosperm seed, between the maternal sporophytic tissue, the endosperm and the embryo is 2 : 3 : 2, so that successful seed formation depends on the maintenance of the genetical balance of the three components, the author suggests that the $3n$ endosperm generation should be regarded as of equal importance, in the angiosperm life-cycle, to the gametophytic and sporophytic generations. Since a third phase of this kind is not found in the life histories of the gymnosperms, pteridophyta or bryophyta but does occur in some algae and fungi, the origin of the angiosperms might be found in some extinct groups of plants derived directly from the thallophyta, rather than in one of the higher groups.

CYTOLOGY

3694 Mühlethaler, K.
Der gegenwärtige Stand der elektronenmikroskopischen Erforschung der Pflanzenzelle. (**The present position of electron-microscope research on the plant cell**).
Naturwissenschaften 1957 : **44** : 204–13.

An outline is given of the knowledge gained by the application of new techniques, including the use of the electron microscope, to the study of the fine structure of the cytoplasm, plastids, mitochondria, spherosomes and cell wall.

3695 Wu, S.-S.
(Newly observed phenomena of the cell nucleus).
Chi-wu-hsueh Pao/Act. bot. sinica 1956 : **5** : 1–14. [Chinese].

Various nuclear anomalies observed in epidermal onion cells, in particular instances of amitosis and passage of nuclei through the cell walls, are described.

3696 Hocquette, M. & Lantreibecq, I.
La région périnucléolaire dans quelques type de noyaux de végétaux supérieurs. **(The perinucleolar region in some types of nuclei in higher plants).**
CR Acad. Sci. Paris 1957 : **244** : 490–91.

Nucleoli in differentiated cells of *Allium cepa, Pisum sativum, Cucurbita pepo* and *Primula obconica* consisted of an inner highly staining region and a Feulgen-positive border. In pea root cells, this nucleolar border decreased in thickness towards the root apex and was completely lacking in meristematic interphase cells. Upon starvation, first the border and then the whole nucleolus gradually disappeared. Treatment with glucose led to regeneration of the nucleolus but not of the perinucleolar ring.

3697 Guttman, R.
Alterations in nuclear ribonucleic acid metabolism induced by kinetin.
J. biophys. biochem. Cyt. 1957 : **3** : 129–32.

Experiments on the enzymatic digestion of nucleic acids in onion roots indicated that kinetin causes an accumulation of RNA (cf. Abst. 92).

3698 Watanabe, I.
The effect of ultraviolet light on the production of bacterial virus protein.
J. gen. Physiol. 1957 : **40** : 521–31.

The effect of ultraviolet irradiation on the appearance of phage-specific protein in T2-infected bacteria growing in a medium containing S^{33} was analysed at different stages of phage development. The results led to the conclusion that once the information necessary for the production of phage-specific protein has been established within the infected cell under the influence of the parental DNA, synthesis of phage-specific protein can continue independently of the synthesis of phage DNA. The possibility that the phage DNA controls the specificity of the phage protein indirectly through substances other than DNA is discussed.

3699 Sharma, A. K. & Roy, M.
The acid phosphatase test in the analysis of chromosome structure.
Phyton 1956 : **7** : 23–36.

Sharma, A. K. & Roy, M.
Chemical constitution and enzyme activity of chromosomes and related structure.
Cellule 1956 : **58** : 109–33.

The authors give the results of a determination of the activity of acid phosphatase in the cytoplasm, nucleus, nucleolus and chromosomes of onion root-tip cells by means of treatments involving proteolytic-enzyme digestion and nucleic-acid extraction. It was concluded that the fine structure of the chromosome is mainly composed of nonbasic proteins.

3700 Overend, W. G. & Peacocke, A. R.
The molecular basis of heredity.
Endeavour 1957 : **16** : 90–98.

Recent work on the structure of the nucleic acids and on the biological significance of the postulated structures is reviewed.

3701 Shimoya, C.
Uma ligeira observação em células mães dos grãos de pólen de *Alstroemeria inodora* Herb., tratada com 8-oxiquinolina e com temperatura. **(A small observation on pollen mother cells of *A. inodora* Herb. treated with 8-oxyquinoline and with temperature).**
Ceres, Minas Gerais 1956 : **9** : 444–51.

In cases where cytological observations are difficult as in this species, treatment at 5° C. before fixing was found to have advantages but little or none was observed after treatment with 8-oxyquinoline.

3702 Battaglia, E.
A new "5 minutes-fixation" in chromosome analysis.
Caryologia 1957 : **9** : 368–70.

The following mixture has been found to be a satisfactory fixative, giving high penetration, for use with the Feulgen technique: five parts of 95% ethyl alcohol, 1 part of chloroform, 1 part of glacial acetic acid and one part of formalin (40% formaldehyde). A schedule for the use of the fixative for root tips is presented, involving fixation for five minutes, washing and hydrolysing in 1N HCl and staining in Schiff's reagent.

3703 Battaglia, E.
"Simultaneous" and "successive pretreatments" in chromosome analysis.
Caryologia 1957 : **9** : 370–71.

The various prefixation treatments used in chromosome analysis are briefly discussed.

3704 Battaglia, E.
A simplified Feulgen method using cold hydrolysis.
Caryologia 1957 : **9** : 372–73.

A method of cold hydrolysis, carried out at room temperature, to be used after the fixation technique described in Abst. 3703 above is discussed.

Three different acids may be used, 18% hydrochloric acid for 20 minutes, 35% nitric acid for 10 minutes or 42% phosphoric acid for 40 minutes, resulting in a decreasing intensity of staining in the order given.

3705 Raper, J. R.
Heterokaryosis and sexuality in fungi.
Trans. N.Y. Acad. Sci. 1955 : **17** : 627–35.
With reference to the literature, the author surveys different types of heterocaryosis and sexual differentiation, discussing the relationship between the two phenomena and the evolutionary significance of trends in this relationship.

3706 Bradley, S. G.
Heterocaryosis in *Streptomyces coelicolor*.
J. Bact. 1957 : **73** : 581–82.
Evidence is presented that *S. coelicolor* 'NRRL-B-1257' forms stable heterocaryons which produce spores containing at least two sets of genes.

3707 Bernfeld, M.
Action de lipides exogènes sur la tige de Pelargonium. (**Action of exogenous lipids on the stem of Pelargonium**).
CR Acad. Sci., Paris 1957 : **244** : 2832–35.
Lipids extracted from human cancerous tissues and applied to wounds in the stem of *P. zonale* diffused rapidly to the medullary parenchyma, which reacted by forming tumours. The lipids penetrated into the nuclei, where they appeared to become concentrated around the chromocentres, and are thought to have caused the endomitoses and other nuclear anomalies associated with tumour formation.

3708 Tschermak-Woess, E.
Über das regelmässige Auftreten von "Riesenchromosomen" im Chalazahaustorium von *Rhinanthus*. (**On the regular appearance of "giant chromosomes" in the chalazal haustorium of *Rhinanthus***).
Chromosoma 1957 : **8** : 523–44.
The enlarged nuclei found in the micropylar and chalazal haustoria of the endosperm tissue of *Rh. alectorolophus* have been found to contain triploid complements of giant chromosomes, each of which appears to consist of the cohering, partially despiralized daughter chromosomes produced by successive endomitoses. Each giant chromosome has a short euchromatic section and a long heterochromatic region, of which a short part is compact in appearance while the longer part, adjoining the euchromatin, shows a diffuse chromomeric structure. Longitudinal strands are visible in the chromosomes of 12 or 24-ploid nuclei but not in those with higher degrees of polyploidy. The chalazal nuclei may attain 384-ploidy, the micropylar nuclei rather less. The number of nucleolar-organizing chromosomes is higher in the chalazal nuclei than in the normal endosperm nuclei.

3709 Kato, Y.
On the endosperm nucleus of *Allium*.
J. Hered. 1957 : **48** : 7–10.
Endomitosis, highly polyploid nuclei and chromosome breakage and reunion characterized cells in the central portion of the endosperm of *A. fistulosum*. These phenomena may be regarded as indicating a degenerative condition of the cells.

3710 Anderson, N. G.
Cell division. Part I. A theoretical approach to the primeval mechanism, the initiation of cell division, and chromosomal condensation.
Quart. Rev. Biol. 1956 : **31** : 169–99.
A detailed presentation of the theory that cell division is brought about by a shift in the polyelectrolyte balance within the cell is made. It is thought that life itself arose from a colloidal system controlled by polyelectrolyte balance. The initiation of cell divisions is envisaged as resulting from a shift in favour of the intracellular polycations. This would bring about chromatin condensation; it is suggested that chromatin condensation would take the form of molecular coiling of DNA and histone with twist reversal along the coils; these coils, in turn, would be wound into secondary helices, either in a uniform direction or with only occasional changes in sense. These secondary helices may be equivalent to the subminor coils of chromosomes.

3711 Anderson, N. G.
Cell division. II. A theoretical approach to chromosomal movements and the division of the cell.
Quart. Rev. Biol. 1956 : **31** : 243–69.
In the present number of this series (cf. Abst. 3710), the theory advanced in the first number is applied to aster formation, spindle formation, chromosome movement, cell fusion and reconstruction of the resting cell. Special attention is paid to the significance of soluble molecular complexes, which, it is believed, could give rise to the mitotic apparatus by a shift in the polyelectrolyte balance. The nature of the charge on the cytoplasmic colloids is discussed at length, the author concluding that it is negative.

3712 Deysson, G. & Truhaut, R.
Sur les propriétés antimitotiques de l'uréthane du glycol et de divers dérivés. **(On the antimitotic properties of glycol urethane and various derivatives).**
CR Acad. Sci., Paris 1957 : **244** : 2189–91.
In studies of the action of the above substances on root-tip cells of *Allium cepa*, the chief effects observed were, first, inhibition of entry into prophase and then the total cessation of mitosis. With some compounds chromosome fragmentation occurred occasionally. Information is provided on the effects of the different radicals upon antimitotic activity.

3713 Sharma, A. K. & Bhattacharyya, B.
Effect of inositol and molybdic acid on somatic nuclei of plant cells.
Phyton 1956 : **7** : 15–22.
The effects of treatment of onion roots with inositol and molybdic acid included the induction of division in polyploid cells and somatic reduction in diploid cells.

3714 Pryzina, E. A.
Cytological effects of 8 azaguanine in terms of mitotic inhibition, its prevention, and its relation to DNA synthesis in the root meristem of *Vicia faba*.
Diss. Abstr. 1956 : **16** : Publ. No. 19,128 : 2010–11.
Mitosis was completely suppressed after 24 hours of treatment with 10 p.p.m. of 8-azaguanine, which exerted its inhibiting effects only before onset of prophase. Of the nucleosides tested as agents preventing this inhibition, adenine and guanine were the most effective.

3715 Truhaut, R. & Deysson, G.
Sur les propriétés antimitotiques d'uréthanes et thiouréthanes cycliques. **(On the antimitotic properties of cyclic urethanes and thiourethanes).**
CR Acad. Sci., Paris 1957 : **244** : 2257–58.
The antimitotic effects of the above classes of compounds upon root-tip cells of *Allium cepa* are described and discussed in relation to the increase or decrease in activity induced by different radicals (cf. Abst. 3712).

3716 Nearby, G. J., Evans, H. J. & Tonkinson, S. M.
Mitotic delay induced by gamma radiation in broad bean root meristems.
Nature, Lond. 1957 : **179** : 917–18.
A method has been devised for determining the actual delay caused by radiation in reaching metaphase. It makes possible the elimination of uncertainty as to the stage of mitosis at the time of treatment in the case of cells observed to be in metaphase at a particular fixation time. If sensitivity to induction of structural changes varies with stage of mitosis, this uncertainty may make precise interpretation of the dose-frequency relationship impossible. Cells are blocked at metaphase by colchicine, the number of metaphase cells accumulated in a given period providing an implicit estimation of developmental time. By determining the ratios of accumulation in control and irradiated material, the delay caused by irradiation in reaching metaphase may be expressed as a function of the normal development time.

3717 Deeley, E. M., Davies, H. G. & Chayen, J.
The DNA content of cells in the root of *Vicia faba*.
Exp. Cell Res. 1957 : **12** : 582–91.
Synthesis curves from the 2c to the 4c level of DNA have been derived from measurements on meristematic cells of *V. faba*. The results indicate that DNA synthesis occurs during the middle third of interphase and that no appreciable change in total DNA occurs during cell division. Cells in the elongating region of the root appear to synthesize DNA from the 2c to the 4c level and from the 4c to the 8c level without subsequent cell division.

3718 Dowrick, G. J.
The influence of temperature on meiosis.
Heredity 1957 : **11** : 37–49.
Observations made at the John Innes Horticultural Institution on *Tradescantia bracteata* and *Uvularia perfoliata* have shown that heat treatment affected the number and position of the chiasmata and the coiling of the chromosomes at meiosis, increase in temperature causing an increase in the frequency of interstitial chiasmata and opening out of the chromosome coils during prophase.

3719 Franke, G.
Die Zytologie der Ascusentwicklung von *Podospora anserina*. **(The cytology of ascus development in *P. anserina*).**
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 159–60.
The course of meiosis in *P. anserina* is described and illustrated, showing that the two nuclei of

a spore are nonsister nuclei of the postmeiotic mitosis.

3720 Quercioli, E.
Nuovi studi sul rapporto fra la costituzione molecolare e l'azione delle cumarine sulla cellula vegetale. (**New studies on the relation between molecular structure and the action of coumarin derivatives on the plant cell**).
Caryologia 1957 : **9** : 177–214.

Continuing the work reported in *PBA*, XXVI, Abst. 73 the effect of a further 21 coumarin derivatives on the roots of *Allium cepa* has been investigated, fragmentation, polyploid mitoses and root initiation being observed. As before, these effects were associated with the presence in the molecule of a lactone ring and an active double bond.

3721 Agostini, S.
L'azione citogenetica di un gruppo di derivati naftalenici. (**The cytogenetic action of a group of naphthalene derivatives**).
Caryologia 1957 : **9** : 377–407.

The effect of naphthalene itself and 14 derivatives on mitosis in root tips of *Allium cepa* has been investigated. A c-mitotic effect has been found in all cases and is thought to be associated with the presence of two benzene rings. It results in the development of tetraploid nuclei in cases where the toxic effect of treatment is not marked. Naphthalene picrate and naphthaleneacetonitrile showed a more marked c-mitotic effect combined with a mutagenic effect and produced considerable fragmentation of chromosomes. Derivatives containing $-HSO_3$ radicals showed decreased mitotic activity while those containing –OH groups had a marked toxic effect. Some influence of the position of the radicals in the molecule on the cytological effect produced was noted.

3722 Fetner, R. H.
A study of factors affecting X-ray induced chromosome aberrations in the microspores of *Tradescantia paludosa*. II. The oxygen effect.
Radiation Res. 1956 : **5** : 365–71.

A reduction in aberration frequencies has been found with decreasing concentrations of oxygen. The data suggest that when irradiations are performed in helium, in the absence of oxygen, there is less rejoining of initial breaks than when oxygen is present. (Cf. Abst. 1149).

3723 Withrow, R. B. & Moh, C. C.
Nonionizing radiant energy as an agent in altering the incidence of X-ray induced chromatid aberrations. I. Effects of far-red and infrared radiant energy on *Tradescantia* and *Vicia*.
Radiation Res. 1957 : **6** : 491–500.

Pretreatment of *Tradescantia* microspores with a band of 710 to 820 mμ at an intensity of 1300 mμ/cm^2. resulted in increases of 47% of chromatid breaks, 3% of isochromatid breaks and 64% of chromatid exchanges. In *V. faba* root tips the increases were 35%, 7% and 100% respectively. Posttreatment of *V. faba* root tips showed an increase of 31% of chromatid breaks and 81% of chromatid exchanges. No significant increases were observed for any of the infrared treatments carried out.

3724 Sharma, A. K. & Bal, A. K.
An investigation on the effect of certain chemicals on the nucleus, and their possibilities in chromosome analysis in plants.
Proc. nat. Inst. Sci. India 1956 : **22** : 57–68.

The use of coumarin, esculin and salicin in chromosome analysis has been investigated in a number of monocotyledenous and dicotyledenous plants. Fragmentation of chromosomes was caused in both groups by salicin and in dicotyledons by coumarin while esculin and coumarin both caused contraction (cf. *PBA*, XXIV, Abst. 81 and XXVII, Abst. 252).

3725 Löve, Á. & Löve, D.
Cytotaxonomical conspectus of the Icelandic flora.
Acta Hort. gothoburg. 1956 : **20** : 65–291.

The chromosome numbers of all the species and races of flowering plants collected by the authors in Iceland are recorded. Most numbers confirm the counts reported for material from other countries. The indigenous plants, constituting about 72% of the whole flora, are considered on the basis of their geographical relationships with the European, Eurasiatic and North-American floras. This consideration leads to a detailed discussion of the origin and age of the Icelandic flora.
The low proportion of endemics supports the view that the high frequency of polyploids in Iceland and other northern climates is not due to the evolution of polyploids through the impact of adverse conditions but rather to the wider tolerance of such conditions by polyploids.

Subsidiary points of interest concerning economic genera are as follows:—

Indigenous *Poa alpina* has $2n = 26$–47, and most frequently $2n = 33$ and 44; $x = 11$ may therefore be a secondary basic number. In *P. alpigena* $2n = 28$–127. Introduced *P. angustifolia* has $2n = 46$–63, while the $2n$ number of introduced *P. pratensis* s. str. ranges from 50 to 78, with 56 and 70 as the most frequent.

Festuca vivipara s. str. has $2n = 28$. Viviparous hybrids between this and related species had $2n = 21$, 28, 35, 42 and 49. *F. richardsonii* and *F. rubra* s. str. both possess $2n = 42$; since their hybrids are highly sterile they are considered to be good species.

Salix callicarpaea has $2n = 190$. It therefore differs in chromosome number from *S. glauca* in which it has been included.

Widespread introgression was detected between at least six taxa of *Betula pubescens* ($2n = 56$), usually listed as separate species and treated here as intraspecific races.

3726 Favarger, C.
À propos des races chromosomiques. (On the subject of chromosome races).
Arch. Klaus-Stift. VererbForsch. 1956 : **31** : 277–85.

Numerous cases, some reported in the literature, some observed by the author, are referred to in which a diploid race occurs in the Alps and the corresponding tetraploid is found in the Swiss plateau or in the Jura; in others the diploid is a relic and the tetraploid enjoys a wider distribution and in still others there is a geographical separation without clear ecological differences. The diploids are considered to be the primitive forms and hence the Alpine flora is in a large measure made up of ancestral forms of species that have in postglacial times attained a wider distribution. The author is not in favour of regarding races differing in chromosome number as taxonomically distinct unless the chromosome differences are accompanied by easily recognizable morphological or other differences.

3727 Sharma, A. K. & Sharma, A.
Evidences of cytological basis of differentiation.
Experientia 1957 : **13** : 143–45.

Further observations on adult cells (cf. Abst. 1140), in this case in species of the Menispermaceae, have shown considerable variation in the chromosome number of cells from different parts of the plant. It is suggested that somatic reduction is responsible for this phenomenon and it is postulated that differentiation is controlled by chromosomes and that the different mature organs of a species contain a chromosome complex specific to each organ and related to the number and type of chromosomes responsible for the differentiation of that organ.

3728 Fincham, J. R. S. & Pateman, J. A.
Formation of an enzyme through complementary action of mutant 'alleles' in separate nuclei in a heterocaryon.
Nature, Lond. 1957 : **179** : 741–42.

When the mutants am^{32} and am^{11} of *Neurospora crassa*, both deficient in glutamic acid hydrogenase, were crossed, very little, if any, genetic recombination occurred. Ascospores giving rise to pseudowild cultures were however obtained with a frequency of about 0·05%. Heterocaryons of the constitution $am^{32} + am^{47}$, originating as pseudowilds or by vegetative hyphal fusion, were able to produce glutamic acid dehydrogenase, although in much smaller amounts than the wild type. Assuming that this enzyme is a single one, the results may be interpreted in either of two ways: (1) synthesis of the enzyme may involve two steps mediated by two distinct nuclear products, or (2) the wild-type *am* locus may act as a unit in producing a single component of the enzyme-forming system and partial reconstitution of this component from two different defective nuclear products may be possible in the cytoplasm of the heterocaryon.

3729 Bernstein, H. L.
New mating types in *Escherichia coli*.
Heredity 1957 : **11** : p. 154. (Abst.)

The discovery of several new mating types in *E. coli* is reported.

BOTANY

3730 Fryxell, P. A.
Mode of reproduction of higher plants.
Bot. Rev. 1957 : **23** : 135–233.

The types of reproductive mechanisms encountered in higher plants are reviewed and an extensive table is given in which published records of mode of reproduction, whether cross-fertilized, self-fertilized or apomictic, and notes on such topics as compatibility and dichogamy, are arranged under families, genera and species.

3731 SCHWEMMLE, J.
Der Samenansatz bei Kreuzungen mit der *Oenothera Berteriana* ♀ nach Früh- und Spätbestäubung. (**Seed set in crosses of *Oe. berteriana* ♀ after early and late pollination**).
Planta 1957 : **49** : 135–67.

In interspecific crosses involving the above species, which is of the genetic constitution B.*l*, the affinity of different pollen types for the two ovule types, as determined from the proportions of seeds carrying either the B or the *l* complex, depended not only on the genetic constitutions of the gametes but also upon the age of the ovule at the time of pollination. Thus among six pollen types, hsc pollen was best in fertilizing young B ovules while I was best with older B ovules. It is suggested that the optimum concentration of a chemotropically active substance produced by the developing ovule varies for different pollen types.

3732 ZAĬKOVSJKA, N. E.
(The problem of somatic fertilization).
Ukraïn. bot. Ž. 1956 : **13** : No. **3** : 92–99. [Ukrainian].

In a reply to a critical article by Oksijuk (cf. Abst. 3128) the writer asserts that investigations of somatic fertilization by various writers, including her own research, are based on concrete evidence and states that the opponents of the theory of somatic fertilization wrongly regard the rarely occurring fusion of the sperm cells with vegetative cells as the chief principle involved and ignore the physiological aspects.

3733 POLYAKOV [POLJAKOV], I. M.
Use of radioactive isotopes in studies of plant fertilization.
Conference of the Academy of Sciences of the USSR on the peaceful uses of atomic energy July 1–5, 1955, Session of the Division of Biological Science. US Atomic Energy Commission, Washington 1956 : 139–44.

Experiments carried out on tobacco, wheat, rye and maize at the Institute of Genetics and Breeding of the Academy of Sciences, Ukrainian SSR, to study fertilization by means of pollen labelled with P^{32} or S^{35} are described (cf. *PBA*, XXVI, Abst. 82). Fertilization was shown to consist not only of "basic" double fertilization but also of a supplementary process effected by pollen tubes in addition to the one introducing the generative cells. It was also demonstrated that the contents of the supplementary tubes may influence the developing embryo. Rough calculations of the total number of pollen tubes transmitting radioactive material to one ovule ranged from 5 in rye and wheat to 2·2–2·8 in maize, in pollinations with labelled pollen only. Multiple fertilization of tobacco by pollen from the mother variety and another type resulted in progeny with increased vigour. When one species of *Nicotiana* received a mixture of its own unlabelled pollen and labelled pollen of a species incompatible with the first, the ovules contained radioactive isotopes although the labelled pollen was unable to take any direct part in fertilization. It is suggested that the isotopes gained entry as the result of physiological reactions between the components of the pollen mixture.

3734 SWAMINATHAN, M. S. & RADHAKRISHNA MURTY, B.
Use of radioactive tracers in the study of pollen tube growth.
Curr. Sci. 1957 : **26** : 59–60.

Using crosses between *Nicotiana tabacum* and *N. rustica*, a technique involving the use of pollen carrying radioactive isotopes was found to provide a rapid and reliable estimation of pollen-tube growth. In the incompatible cross *N. tabacum* ♀ x *N. rustica* ♂, the tube did not grow further than one-third of the length of the style. The P^{32} and S^{35} added to the nutrient solution to which plants to be used as ♂ were transferred had no adverse effect upon pollen viability or upon seed production by selfing.

3735 ERNST-SCHWARZENBACH, M.
Die genetische Determination der Selbst-Inkompatibilität bei Blütenpflanzen. (**The genetical determination of self incompatibility in flowering plants**).
Arch. Klaus-Stift. VererbForsch. 1956 : **31** : 260–76.

The system of self incompatibility determined by *S* and *R* genes, their behaviour in polyploids and various X-ray mutants that have been described (cf. *PBA*, XXV, p. 101) are referred to and it is pointed out that the results require the gene to be envisaged as having two or more zones, affecting the reaction of style and pollen respectively, in the same way as Ernst and the author have assumed in the case of genes determining heterostyly.

3736 Ernst, A.
Stammesgeschichtliche Untersuchungen zum Heterostylie-Problem. 4. Konvergenzen und Divergenzen in der Ausprägung der Heterostylie-Merkmale in *Primula*-Sektionen desselben Verbreitungsareals. (**Phylogenetic investigations on the problem of heterostyly. 4. Convergencies and divergencies in the expression of heterostyly characters in *Primula* sections having the same area of distribution**). Arch. Klaus-Stift. VererbForsch. 1956 : **31** : 129–247.

Further extensive investigations of species in sections *Muscarioides*, *Soldanelloideae* and *Capitatae* give evidence pointing towards the secondary origin of homostyly in heterostylic species in addition to the existence of primary homostylic species.

ECONOMIC LOWER PLANTS

3737 Mindlin, S. Z. & Alihanjan, S. I.
[**Biochemical mutants of *Actinomyces rimosus* (a producer of terramycin)**].
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **111** : 884–86. [Russian].

Mutants obtained by ultraviolet irradiation of an industrial strain could only grow upon a substrate such as maize extract containing methionine and niacin and produced no terramycin unless increased amounts of methionine, in the case of one strain, or of niacin in the case of the other, had been added to the substrate; the terramycin production then rose to normal.

3738 Brockaja, S. Z.
(**Obtaining active strains of moulds in the genus *Aspergillus* with improved proteolytic activity**).
Mikrobiologija (Microbiology), Moskva 1956 : **25** : 3–11. [Russian].

Some wild strains of *Aspergillus* had a higher proteolytic activity than an industrial strain of *A. oryzae*. This was notably the case with a rough strain of *A. nidulans*, which was obtained by subjecting a smooth wild strain, with the desired characteristics, to ultraviolet radiation.

3739 Loginova, L. G.
(**The vitamin requirements of a thermophilic form of yeast obtained experimentally**).
Mikrobiologija (Microbiology), Moskva 1956 : **25** : 415–19. [Russian].

A new form of *Saccharomyces cerevisiae* which multiplies actively at 40° C. was obtained by adaptation to gradually increased temperature. Changes in its vitamin requirements, as compared with the parent strain, are noted.

3740 Mosiašvili, G. I. & Osipova, S. A.
(**An experiment on the selection of wine yeasts**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 8 : 8–10. [Russian].

A strain of *Saccharomyces vini* selected from Kahetian wine fermented musts with a high enotanin content more actively than a strain selected from European types of wine, but the latter strain was capable of fermenting more acid musts.

3741 Middlekauff, J. E., Hino, S., Yang, S.-P., Lindegren, G. & Lindegren, C. C.
Gene control of resistance vs. sensitivity to actidione in *Saccharomyces*.
Genetics 1957 : **42** : 66–71.

Resistance *vs.* sensitivity to actidione depended upon a single pair of genes, *Acac*. Liquid culture, an actidione concentration of 1 ppm. and an inoculum of 6 x 10^4 cells together provided the optimum conditions for diagnosis of the genotype.

3742 Losada, M.
The hydrolysis of raffinose by yeast melibiase and the fermentation of raffinose by complementary gene action.
CR Lab. Carlsberg : Sér. Physiol. 1957 : **25** : 460–82.

It has been shown that the complete hydrolysis of raffinose is brought about not only by the complementary action of the *R*-gene for β-h-fructosidase and the *Me*-gene for α-galactosidase but also by the complementary action of the *Me*-gene and the *M*-gene for α-glucosidase (cf. *PBA*, XXVI, Abst. 2044). Yeasts of the genotype *MeM* are able to bring about a 2/3 fermentation of the raffinose molecule or a complete fermentation if they also contain the *G*-gene for galactozymase. *R* cultures were found to ferment raffinose more rapidly that either *MeM* or *MeMG* cultures and slow raffinose fermentation was also brought about by the complementary action of *Me* and g_8. Hybrids produced by crossing two non-fermenters (*Mem* x *meM*) were able to ferment raffinose and their progeny yielded 0 : 4, 1 : 3 and 2 : 2 ratios in respect of their powers of fermentation in close agreement with the expected results.

3743 Winge, Ø. & Roberts, C.
A genetic analysis of melibiose and raffinose fermentation.
CR Lab. Carlsberg : Sér. Physiol. 1957 : **25** : 419–59.
This article constitutes a more detailed description of the study already summarized in *PBA*, XXVI, Abst. 2044 from another source.

3744 Mortimer, R. K. & Owen, M. E.
X-ray induced dominant lethality in haploid and diploid *Saccharomyces cerevisiae*.
Radiation Res. 1956 : **5** : p. 587.
After X irradiation of one or both parent cells the following single cell pairings were made between cells of each mating type: haploid x haploid, haploid x diploid, diploid x haploid and diploid x diploid, the diploids being homozygous in each case. Survival curves of haploid, diploid, triploid and tetraploid vegetative cells were determined and recessive lethal inactivation assayed by comparison. The ratio of dominant to recessive lethal inactivation in the haploid was about 1 : 15 and in the diploid 1 : 1, with the diploids being about twice as sensitive to dominant lethals, suggesting that the degree of damage depends on the product of ploidy and dose. The results confirm the hypothesis put forward by the authors that the importance of dominant compared to recessive lethal inactivation of yeast cells by X rays increases sharply with increasing ploidy.

3745 Winge, Ö. & Roberts, C.
Remarks on irregular segregations in *Saccharomyces*.
Genetica 1957 : **28** : 489–96.
After critically discussing the work of Mundkur summarized in *PBA*, XXI, Abst. 858, and of Lindegren *et al.*, Ogur and St. John and Pittman and Pedigo, summarized in *PBA*, XXVII, Absts. 119–121, the authors conclude that no proof of the existence of gene conversion has been offered and that such irregular segregation as has so far been reported can be explained by supernumerary mitosis, supernumerary mitosis + binucleate spores, mutation, interallelic crossing over, polyploidy or cytoplasmic inheritance.

3746 Kosikov, K. V.
[Distant hybridization of yeasts. I. Obtaining hybrids between *Saccharomyces cerevisiae* (race XI) and *Schizosaccharomyces pombe*].
Mikrobiologija (Microbiology), Moskva 1956 : **25** : 275–78. [Russian].
A culture containing hybrid cells was obtained by copulation between the spores of the above species. The hybrid cells divided mainly by budding as in *S. cerevisiae* though some cells had walls like those of *S. pombe*. The formation of narrow canals between the spores of the different species suggests that only plasmogamy occurred. It is thought that the formation of narrow copulation canals may be a primitive mode of hybridization in other microorganisms too.

3747 Kosikov, K. V.
[Distant hybridization of yeasts. II. Obtaining hybrids between *Saccharomyces cerevisiae* (race XII) and *Schizosaccharomyces pombe* by copulation of the cells].
Mikrobiologija (Microbiology), Moskva 1956 : **25** : 420–22. [Russian].
In a mixed culture of the above species hybrid cells occurred which divided by budding as in *S. cerevisiae* but had walls characteristic of *S. pombe*. It is thought that they arose by copulation of haploid cells of *S. pombe* with diploid cells of *S. cerevisiae* but without fusion of the nuclei. The hybrid culture fermented beer wort at a different rate from the parent species.

3748 Kosikov, K. V.
[Distant hybridization of yeasts. III. Obtaining hybrids between *Saccharomyces cerevisiae* (race XII) and *Schizosaccharomyces pombe* by the copulation of germinating cells].
Mikrobiologija (Microbiology) 1956 : **25** : 533–36. [Russian].
Hybrid cells from a mixed culture of the above species resembled *S. pombe* but multiplied by budding as in *S. cerevisiae*. The spores were not viable. Unlike the parent species, the hybrid could not ferment maltose and simple dextrins. It is suggested that the hybrid arose by nuclear fusion. By culturing the hybrid at 40° C. a form with the morphological and enzymic properties of *S. cerevisiae* was obtained. It is thought that it arose as a result of segregation among the vegetative progeny of the hybrid.

3749 Thyagarajan, T. R. & Subramaniam, M. K.
The nucleus of the living zygote of *Saccharomyces carlsbergensis*.
Proc. Indian Acad. Sci. 1957 : **45** : 187–95.
The nucleus was visible in zygotes on the seventh day after introduction of spores into fresh wort. A membrane delimiting the nucleus from the cytoplasm and enclosing unspecified structures was revealed by means of the phase-contrast

microscope. The structure of the nucleus was identical in zygote and bud.

3750 McClary, D. O., Williams, M. A., Lindegren, C. C. & Ogur, M.
Chromosome counts in a polyploid series of *Saccharomyces*.
J. Bact. 1957 : **73** : 360–64.
Chromosome counts carried out on sporulating diploid, triploid and tetraploid strains of three Carbondale strains of *Saccharomyces* indicate that the haploid chromosome number is 4.

CROP PLANTS

Proceedings of the International Conference on the Peaceful Uses of Atomic Energy. Volume 12. Radioactive Isotopes and Ionizing Radiations in Agriculture, Physiology and Biochemistry.
United Nations, New York 1956 : Pp. ix + 553.

3751 *The uses of atomic energy in food and agriculture.* (*pp. 10–18*).
In this contribution from FAO mention is made of the use of various sources of radiation to induce mutations, thus increasing the variability available to the plant breeder for selection. Examples of more desirable strains produced by this means are briefly mentioned.

3752 *Singleton, W. R., Konzak, C. F., Shapiro, S. & Sparrow, A. H. The contribution of radiation genetics to crop improvement.* (*pp. 25–30*).
Several of the examples quoted in this paper have already been summarized in *Plant Breeding Abstracts* from other sources. Others include: mutants of Tama oats possessing resistance to *Helminthosporium sativum* var. *victoriae*, obtained by thermal neutron and X irradiation; maize lines resistant to *H. turcicum*, obtained by irradiation of pollen in the thermal column of a nuclear reactor; and somatic mutations in maize, affecting the P^{RR}/p gene, obtained by γ radiation. Most of the work reported was carried out at the Brookhaven Laboratory.

3753 *Ehrenberg, L., Granhall, I. & Gustafsson, Å. The production of beneficial new hereditary traits by means of ionizing radiation.* (*pp. 31–33*).
A general review is given of work carried out in Sweden on the induction of mutations and their use in breeding (cf. *PBA*, XXV, Absts. 155–75).

3754 *Mikaelsen, K. Studies on genetic effects of chronic gamma radiation in plants.* (*pp. 34–39*).
Work carried out in the Norwegian radiation field at the Agricultural College of Norway, Vollebekk, is described. Using Ir^{192} or Co^{60} a large number of crop plants have been subjected to γ radiation, among the results obtained being chlorophyll mutants in barley and chromosome aberrations and somatic mutations in *Tradescantia*.

3755 *Caldecott, R. S. Ionizing radiations as a tool for plant breeders.* (*pp. 40–45*).
Dormant barley seeds have been subjected to X rays, 2-Mev electrons, thermal neutrons and fast neutrons with a view to comparing the effects of these treatments (cf. *PBA*, XXIV, Abst. 2959). Pronounced differences in the effect of radiation treatment have been found to result from pretreatment of the seeds by subjecting them to differing degrees of hydration and oxygenation. The effectiveness of X rays in producing genetic changes is increased by presoaking and by oxygen treatment while presoaking decreases the effectiveness of fast and thermal neutrons. It is suggested that densely ionizing radiations will be of greater use for breeding purposes than sparsely ionizing radiations since the former produce more genetic effects per unit survival.

3756 *Murati, K. & Moriwaki, D. Genetic effects induced in plants.* (*pp. 46–47*).
Studies have been carried out in Japan of the effects on crop plants of the atomic explosions at Hiroshima and Nagasaki. Among morphological abnormalities observed in rice were shorter straw, dense ears and triangular, narrow or short grains. One haploid, one asynaptic and a number of partially sterile plants were found, partial sterility recurring among the progeny of inbred fertile plants derived from partially sterile parents. Various chromosome aberrations were observed in such plants, including reciprocal translocations. The asynaptic plant mentioned above produced two seeds, one of which gave a fertile plant whose progeny segregated into fertile and sterile plants in the ratio of 3 : 1. It is concluded that asynapsis is determined by a single recessive gene.

3757 *Gregory, W. C. The comparative effects of radiation and hybridization in plant breeding.* (*pp. 48–51*).
It is suggested that the value of irradiation in the field of plant breeding depends on the extent

to which induced genetic variation either supplements or replaces the natural resources of genetic variability. The usefulness of increased variation in established characters will depend on the magnitude and distribution of the variation induced while the probability of the production of new, desirable characteristics is decreased by the fact that the types of changes desired cannot be determined by the treatment and the chance of a random change being desirable is very low. The paper is illustrated by reference to work carried out with groundnuts (cf. *PBA*, XXV, Abst. 1731 and XXVI, Abst. 1756).

3758 *Myers, W. M., Ausemus, E. R., Koo, F. K. S. & Hsu, K. J. Resistance to rust induced by ionizing radiations in wheat and oats.* (*pp. 60–62*).

Dry seeds of Ajax and Clintafe oats and Lee wheat were treated with thermal neutrons at a dose of approximately 9·94 x 10^{12}/cm.^{2} and Lee was also treated with X rays at 12,000 r. and 16,000 r. at the Brookhaven National Laboratory. When grown at several localities in the United States, four progenies of Lee were found to possess resistance to race 15B of *Puccinia graminis* var. *tritici* while six N_2 progeny of Ajax and 2·3% of the N_2 progeny of Clintafe showed resistance to races 7 and 8 of *P. graminis* var. *avenae* but in addition some resistant progenies were also found in untreated Clintafe. Some of the resistant plants obtained in this study gave progeny resistant to one or both races. A number of chlorophyll-deficient mutants were also found among the N_2 progeny.

3759 *Record of proceedings of session 13C.2.* (*pp.63 –71*).

In presenting his paper W. R. Singleton (USA) mentioned radiation breeding programmes in Sweden and the United States and the γ-radiation field at the Brookhaven National Laboratory. Examples of radiation-induced endosperm mutations in maize are also mentioned. L. Ehrenberg (Sweden) described the induction of useful mutations in barley (particularly erectoid mutations), sweet lupin and white mustard.

3760 **Research promotes prosperity.** Fm. Home Sci. 1956 : **17** : 74–116.

This general review of agricultural research in Utah mentions the development of Alpine barley (cf. Abst. 1750), and Loran Blood and V–R Moscow tomatoes (cf. *PBA*, XXIV, Abst. 736) and the breeding of safflower, onions and Lima beans.

3761 Crescini, F. Intorno alle basi del miglioramento genetico delle piante coltivate: il metodo. (**On the subject of the genetical improvement of cultivated plants: the method**). Atti Accad. Georgof. Firenze 1956 : **3** : Pp. 17.

The various techniques used in the breeding of crop plants are surveyed in this lecture.

3762 Souček, J. Kontaktní fotokopie—důležitá součást šlechtitelské dokumentace. (**Contact photocopy, an important part of the breeder's documentary evidence**). Ovocnářství a Zelinářství 1957 : **5** : 121–23.

A method of recording breeding material is described, suitable for such organs as leaves and fruits. Prints of leaves are made on contact photopaper. The positives show the shape of the leaf, the intensity of chlorophyll and the nervation. For fruits, a 1–3 mm. slice has to be made. For highly succulent fruits, transparent foil is inserted between the slice and the photopaper. The distribution of lignin can be recorded by staining with phloroglucin and HCl.

3763 Dorst, J. C. **Presidential address to the congress on the occasion of the foundation of a European Association for Research in the Field of Plant Breeding.** Euphytica, Wageningen 1957 : **6** : 1–3.

The text is given of the address delivered at the first congress of the above association, held at Wageningen during July 1956.

3764 Câmara, A. Regiões de interesse genético. (**Regions of genetic interest**). Agros 1957 : **40** : 1–8.

This is the full Portuguese text of the contribution referred to in Abst. 1382.

Report of the Scottish Plant Breeding Station, Pentlandfield, Roslin, Midlothian 1957 : Pp. 73.

3765 *Director's Report.* (*pp. 5–26.*)

Oats. The results of trials of 25 unfixed F_3 selections and 27 fixed strains selected from several different hybrids indicate that smaller differences in yield occur between related strains than between unrelated strains. Preliminary results suggest that more than one type of resistance to or tolerance of *Ditylenchus dipsaci* may exist.

Herbage plants. A very erect type of late ryegrass has been developed from Danish wild material with a view to its use as a silage crop. The polycross trials of cocksfoot and ryegrass continued (cf. Abst. 148).

The testing of plants of *Festuca ovina* for resistance to lead has begun in the small controlled environment chamber but it is not yet clear whether there are two types of fescue, tolerant and intolerant, or a range showing varying degrees of tolerance.

"Evidence is accumulating that the chance of isolating a genotype of a perennial species more than once in a population sample is much greater than had previously been supposed. Chance reduplication of genotypes leads to a low standard error and hence a spuriously high significance of difference between populations".

Swede. Various methods of propagation are reviewed and it is concluded that the use of the potential self-fertility of the swede has little or no advantage over the methods practised by the seed trade. The vigour of mass-propagated seed lies between that of inbred lines and heterotic F_1 hybrids. A self-incompatible stock is under examination with a view to its possible use in the commercial production of F_1 hybrid seed.

Potatoes. A laboratory test for assessing the relative degree of field resistance to *Phytophthora infestans* of varieties and seedlings has been developed, using race 1, 2, 3, 4 of the fungus. The results showed that moderate field resistance may be obtained from many species, including *Solanum tuberosum*, but that recognized blight-resistant species, such as *S. demissum* and *S. stoloniferum*, provide a much greater degree of protection. High-yielding field-resistant selections bred from *S. demissum* and *S. simplicifolium* are now in comparative trials. Differences in degree of infection were found between 53 seedlings from the Scottish Plant Breeding Station tested in the Toluca Valley in Mexico. These differences corresponded in most cases with those found in laboratory tests.

Isolates of *Heterodera rostochiensis* from a number of localities in Scotland and England were found to be "aggressive", that is, they were able to break down the resistance of clone CPC 1673 of *S. tuberosum* ssp. *andigenum*. Six clones of *S. vernei*, a diploid wild potato, were found to be resistant to both normal and "aggressive" eelworm populations.

Seedlings under trial include selections resistant to viruses X and Y, leaf roll and normal root eelworm and possessing field resistance to late blight.

Selected seedlings from *S. phureja* 4*n* (= *S. rybinii* 4*n*) x *S. tuberosum*, (*S. phureja* x *S. simplicifolium*) 4*n* x *S. tuberosum* and *S. stoloniferum* x *S. tuberosum* were all found resistant to 14 strains of virus Y. Two new viruses, designated Y_2 and NS, both of which cause symptoms typical of virus Y on non-potato hosts, possess characteristics linking them to the Y and A groups of viruses. Y_2 floculates anti-Y serum and activates the gene *Ny* in *S. demissum* and *S. simplicifolium* and also the *Na* gene in the former species. It is transmissible by sap inoculation but not by aphids whereas NS is transmissible by both means. The latter virus activates the *Na* gene but does not react with anti-Y serum. All attempts to infect potato varieties with this strain have failed while infection by Y_2 results in the production of local lesions.

Studies on strains of virus X indicate that the strains activating the gene *Nb* form a circumscribed and relatively uniform serological group characterized by the presence of a specific antigenic factor and the absence of several antigens found in other groups.

Genetical studies have continued of Y resistance in the first and second back crosses to *S. tuberosum* of *S. phureja* and *S. stoloniferum* and of immunity and hypersensitivity to virus X in material derived from *S. acaule*, on the one hand, and US41956 and domestic varieties on the other.

Kale. Hybridization between thousand-headed kale and kohl rabi is under way with a view to exploiting the short-stem character of the latter and possibly obtaining a leafy form for winter use. The progeny showed considerable variation of stem length and thickness and yield of leaf. Triple hybrids have been made with broccoli.

Hybrid lines from thousand-headed kale x Royal Oak broccoli have good leafage but long single or branched stems. Some of these lines had higher leaf : stem ratios than the kale control lines while the kohl rabi hybrids had lower ratios.

3766 *Black, W. Incidence of physiological races of* Phytophthora infestans *in various countries.* (*pp. 43–49*).

Tables are provided showing the world distribution of the 16 races of *P. infestans* and the relative frequency of occurrence of races 0 and 4 in different countries. The evidence discussed suggests a gradual and simultaneous decline of race 0 and its replacement by race 4 as the commonest biotype.

It is recommended that field resistance rather than hypersensitivity should be the aim of breeding for resistance, since hypersensitivity eventually breaks down.

3767 *Dunnett, J. M. "Embedded cysts" in relation to the utilisation of potato root eelworm resistance.* (*pp. 50–56*).
Under controlled conditions in pots under glass the incidence of embedded cysts of *Heterodera rostochiensis*, developed *in situ* on tubers, was greater on susceptible commercial varieties than on resistant seedlings.

3768 *Davey, V. McM. The sowing date of sugar beet in Scotland.* (*pp. 57–73*).
Data are included on the bolting behaviour when sown at different dates of KNB178, Klein E and KLT/NF and on the effect of sowing date on yields of root and sugar in trials at Corstorphine, Edinburgh.

3769 HARLAND, S. C.
Plant breeding : present position and future perspective.
IIIrd Bateson Lecture. John Innes Horticultural Institution 1955 : Pp. 15.
In introducing this lecture the speaker mentioned some of the important lines of work, including the investigation of interaction between nuclear and cytoplasmic components, the study of chimeras and the use of haploids and doubled haploids to measure the effects of gene dosage, which have developed from the study of exceptions recommended by Bateson. The aims and methods of research stations where genetical studies are carried out are then reviewed, emphasis being laid on the importance of unrestricted access to genetical material and the conservation of genetical variability by the establishment of gene pools devoted to material with special attributes. In discussing breeding for disease resistance it is recommended that interspecific hybridization should be employed rather than radiation breeding, since during irradiation on a large scale, as at Brookhaven, large numbers of pathogens as well as host plants will be irradiated and mutations to greater virulence may be expected to occur. The importance of breeding for quality as well as for yield is illustrated by reference to work carried out with cotton and it is concluded that the components of yield are too numerous and their interactions too complex to make a detailed study profitable. The speaker concluded by emphasising the need for daily and not merely final yield records in order to show as far as possible the interaction between the physiological, genetical and environmental aspects of yield.

Forty-seventh Annual Report of the John Innes Horticultural Institution 1956 (1957) : Pp. 47.

3770 *Williams, W. Department of plant breeding.* (*pp. 5–11*).
A technique involving the injection into stems of sodium dihydrogen phosphate containing P^{32} has been developed, with a view to inducing mutations in active meristems by the accumulation there of radioactive phosphorus.

Apple. Scab-resistant segregates have been isolated from a wide range of sources by means of seedling inoculation, some of the most interesting and promising being from open-pollinated Cox's Orange Pippin. Of 3000 seedlings from this source 29 showed various degrees of resistance, 10 developing only local necrosis with no subsequent infection. Controlled crosses involving varieties reputed to be scab resistant gave less than 0·5% resistant progeny. Resistant F_1 seedlings have been obtained from crossing cultivated varieties with *Malus floribunda*, *M. hupehensis*, *M. sieboldii* and *M. halliana* but not from crosses involving *M. micromalus* or *M. sublobata*.

Mildew resistance has been found in segregates of cultivated varieties of *M. pumila* and in seedlings of several wild species, open-pollinated seed of *M. hupehensis* and *M. florentina* yielding 100% resistant progeny, although apomixis is suspected in both these species.

A selection from the cross Cox's Orange Pippin x Ellison's Orange has been released under the name Merton Beauty.

Pear. The abnormal behaviour of Beurré Bedford when used as a pollen parent has received further investigation (cf. *PBA*, XXVI, Abst. 3061). The mechanism for the elimination of zygotes, resulting in the preponderance of diploid and tetraploid progenies, lies in a dosage-dependent embryo lethal, selection operating on the balance between chromosome sets in the very young embryo and not in the gametophytes. When Beurré Bedford is used as the male parent fertilization occurs irrespective of the constitution of the pollen but only a small proportion of the embryos develop normally beyond the two- or three-celled stage, the remainder aborting.

Rubus. Reselection has been carried out on the basis of good flavour and cropping qualities among the progeny of crosses involving the Park Lane raspberry.

Only one valuable seedling has been selected from 500 thornless segregates of selfed Merton Thornless blackberry. It is suggested that this may be a result of inbreeding depression or of autosyndesis in an interspecific hybrid.

A study of apomixis in *Rubus* species indicates that pseudogamy occurs, that is fertilization of the endosperm but not of the embryo. Differences have been observed in the rates of development among progeny, depending on the male parent used. Derivatives from *R. laciniatus* x *R. nitidioides* were more vigorous throughout their first year of growth from seed than comparable material from selfed *R. laciniatus* and seedlings resulting from cross pollination flowered three weeks earlier, indicating a physiological difference persisting well into adult life between the two types of progeny. Differences were also found in comparable families of *R. procerus* and *R. calvatus*.

Recent observations have shown that a taxonomically useful relationship exists between the dimensions of the seeds in apomictic and sexual species; in the former case there is a strong correlation between seed length and breadth while in the latter no such correlation is found.

Most diploid species of *Rubus* were found to have above 90% pollen fertility, exceptions being *R. giraldianus* where 30% of the grains were empty and *R. tomentosus* with larger and more variable pollen than other diploid species. Most tetraploid species had 55–65% viable pollen but *R. caesius* was found to have over 90%.

Studies of the root tips of Youngberry have shown chromosome numbers ranging from $4x = 28$ to $7x = 49$ within the same plant and it is noted that the *R. ursinus* parent of this hybrid also shows a wide variation in chromosome number.

Strawberry. It has been confirmed that the transmission of June yellows is greater through the pollen than through the egg cell, supporting the view that the cause of the condition is a mutant or rogue plasmagene. No connexion has been found between the incidence of yellows and clonal propagation.

The survey of breeding material has resulted in the isolation of 15 clones, representing 10 unrelated sources, possessing resistance to *Phytophthora fragariae*. Out of 112 clones 9% are now believed to carry independent sources of resistance.

Tomato. A lateral supressor mutation, found in several plants of Antimold B (Leafmould Resister x Vetomold), has been shown to cause almost complete suppression of axillary shoots but in addition exhibits some undesirable effects, including suppression of petals, loose and deformed anther columns, reduction in flower number per truss and in certain gene backgrounds cessation of terminal growth. No change in mutant expression was found in F_2 progenies with gene backgrounds derived from *Lycopersicon esculentum* parents but some variation, allowing for selection towards normal flower production and fertility, was found in F_2 progeny from *L. pimpinellifolium* crosses. In almost all gene backgrounds the average flower number per truss in homozygous recessive genotypes (*lsls*) is about half of that in normal plants segregating in second generation progeny. So far studies using markers on all the chromosomes have failed to detect specific regions within the chromosome set of *L. esculentum* which can appreciably raise flower number in homozygous recessives.

In an investigation of the value of hybrid vigour in tomato production F_2 plants of Hertford Cross and Ware Cross were selected for early flowering and early ripening. A high degree of correlation was found between these two characters and segregates as early or slightly earlier than the earliest parent appeared among the F_2 progeny. No evidence was found of heterosis for early flowering and ripening and some other characters and the F_2 population was only slightly more variable than the F_1 or the parents.

3771 *Lewis, D. Department of Genetics.* (*pp. 12–18*).

Correlations of about 0·4 between size of cotyledons or second leaves and yield were found in potatoes, sugar beet and turnips and of 0·2 in carrots. In radishes the correlations were 0·7 between size of early leaves and root weight at commercial harvesting time and 0·5 if the plants were grown to maturity. Provided that this correlation is not caused entirely by the environment of the seedling it is suggested that selection by progressive elimination of the smallest-looking seedlings might prove valuable to plant breeders.

It has been found in studies carried out at the University of Wisconsin that the chromosome number of *Venturia inaequalis* is $n = 7$, synapsis occurs between short chromosomes before maximum extention is reached and segregations of certain colour mutants are visible in the ascus after fixing and staining. Although hyphal fusion between uninucleate vegetative mycelia was confirmed, attempts to synthesize balanced heterocaryons failed.

A number of colour mutants and others with specialized nutritional requirements have been

isolated following treatment of conidia of *Cladosporium fulvum* with ultraviolet light.
Several biochemical and morphological mutants of *Coprinus lagopus*, by means of which dicaryons have been separated asexually into their component monocaryons, have been obtained from the California Institute of Technology. One of the morphological mutants, when present with a wild type nucleus in a dicaryon, has been found to be unstable and it has also been shown to change from mutant to wild type and back in a monocaryotic mycelium. Some stocks have been found to possess resistance to acriflavine.

3772 *Dodds, K. S. Department of Potato Genetics.* (*pp. 19–21*).
Out of 30 different lines of *Solanum phureja* in the Commonwealth Potato Collection, 20 have been found heterozygous for a recessive gene *ym* which when homozygous produces plants having leaflets with yellow margins. Thirty seedlings were planted from each of two crosses between unrelated *YmYm* and *Ymym* lines; 20 were found to be heterozygous, *Ymym*, and 32 homozygous, *YmYm*. The former group gave significantly higher yields suggesting a heterotic effect on yield of that part of the chromosome bearing the *Ym* locus. This would account for the high frequency of heterozygotes in native cultivations since the higher yielding plants could be preferentially selected.
S. vallis-mexici is a triploid, $2n = 36$, which shows a tendency to form 12 bivalents and 12 univalents at meiosis. Some hybrids between *S. stoloniferum* ($2n = 48$) and *S. verrucosum* ($2n = 24$) were morphologically and cytologically indistinguishable from *S. vallis-mexici* and it is suggested that the species may have arisen as a natural hybrid.
A tetraploid hybrid between *S. stoloniferum* ($2n = 48$) and *S. tuberosum* ($2n = 48$) has been found immune to virus Y but susceptible to some strains of late blight. By back crossing to *S. tuberosum*, lines have been selected possessing immunity to a range of strains of virus Y and races 1, 2 and 4 of *Phytophthora infestans*. These lines have been crossed to *S. tuberosum* and selection is continuing.

3773 *Chayen, J. Cell Biology.* (*pp. 22–25*).
All cells of *Vicia faba* root tips at prophase were found to contain twice as much DNA as cells at telophase in the same sample. Nuclei in interphase showed all values from the 2c to the 4c amount, suggesting a synthesis of DNA during this phase. From the data obtained a tentative synthesis-time curve has been produced from which it appears that DNA synthesis occurs in the last third of interphase. No increase was found between prophase and metaphase (4c) and anaphase and telophase nuclei all contained the 2c amount.

3774 *La Cour, L. F. Cell Biology.* (*pp. 25–31*).
Little correlation has been found between the distribution of chromosome breakage among the five chromosome types and total heterochromatin content or chromosome length in hybrid endosperms from *Paris quadrifolia* ♀ x *Trillium* spp. ♂. Within chromosome classes a strong indication of correlation between breakage frequency and number of heterochromatic segments was found. It is noted that in endosperms from the intergeneric hybrid with *P. quadrifolia* as the male parent, *Trillium* chromosomes do not break and breakage in *Paris* chromosomes is negligible. *Trillium* chromosomes in *Paris* cytoplasm show impeded movement in mitosis.
It is suggested that since the breakage produced by X rays in coiled metaphase chromosomes remains hidden until the next mitotic cycle a similar effect might be expected in heterochromatin when irradiated in the coiled telointerphase state. This theory was tested using synchronized mitoses in *Trillium* endosperm and cold treatment following irradiation to distinguish heterochromatin from euchromatin. The results, which are tabulated, indicate that the expression of breakage in heterochromatin is not delayed when it is irradiated in a condensed interphase state and that it is unlikely that the difference in behaviour between euchromatin and heterochromatin is a reflection of differences in degree of primary breakage.
In *Setcreasea purpurea* infrared treatment during meiosis results in the formation of terminal chiasmata at the expense of interstitial chiasmata, unlike the situation found in *Tradescantia* (cf. *PBA*, XXVI, Abst. 3063).
Identical maleic hydrazide treatments given to 14 varieties of *Vicia faba* produced breaks in similar regions of the chromosomes in all varieties but the amount of breakage varied between varieties, indicating that there may be a difference in size of heterochromatic segments between varieties. The greatest differences have been found between Saatzucht and Algarve; in the former 64% of breaks occur in a large heterochromatic segment in the nucleolar arm of the M chromosome while in the latter only 24% occur in this region, the others being distributed among other heterochromatic segments in the S chromosomes. Reciprocal crosses have been

made between these varieties in order to study the way in which heterochromatic segments associate in the interphase nucleus of the F_1 hybrids.

Report of the Rothamsted Experimental Station for 1956 (1957) : Pp. 280.

3775 *Watson, D. J. Botany department.* (*pp. 76–87*).
Continuing the studies reported in Abst. 155 it has been shown that no varietal differences in net assimilation rate exist between Plumage Archer, Herta and Proctor barleys, the higher grain yield of Proctor and Herta being due therefore to a difference in the distribution between ears and shoots of the products of photosynthesis after ear emergence. Herta was found to take up phosphorus more slowly than the other varieties.
Two wild strains of *Beta vulgaris* subsp. *maritima* were found to have mean net assimilation rates similar to those of Klein E, indicating that prolonged selection for high yield has not increased the photosynthetic ability of the leaves.

3776 *Bawden, F. C. Plant pathology department.* (*pp. 98–120*).
Plants of King Edward potatoes free from paracrinkle virus and of Arran Victory free from virus S have been obtained by culturing the stem apical meristem on agar.
Only Kelvedon Triumph and Harrison's Glory peas were found to be resistant to *Fusarium oxysporum* in field tests in Essex. Of a large number of *F. oxysporum* isolates from wilt-sick soil only 8·6% were pathogenic to Onward and none to Alaska or Delwiche Commando, while over 80% of the isolates from the roots of diseased Onward infected healthy plants of that variety. Further studies were made of the rhizosphere populations and root exudates from pea varieties susceptible to three races of *F. oxysporum* f. *pisi*. Onward, susceptible to race 1, had more fungi, bacteria and actinomycetes near its roots than did Alaska or Delwiche Commando, which are resistant to race 1, and qualitative differences between rhizosphere populations were more marked for the latter two varieties. Spores of a race able to wilt a given variety were found to germinate better in rhizosphere soil extract from that variety than in soil extract from a resistant variety. It is suggested that the roots of varieties resistant to race 1 either secrete substances preventing the germination of race 1 spores or stimulate a soil microflora with this effect.

3777 *Jones, F. G. W. Nematology department.* (*pp. 121–26*).
The increase of population of *Ditylenchus dipsaci* in a susceptible oat variety was found to be rapid, while almost no increase occurred in a resistant variety although invasion was heavy.
Tests of resistant progeny from *Solanum andigenum* x *S. tuberosum* have confirmed the existence of resistance-breaking biotypes of *Heterodera rostochiensis* in a number of localities in the British Isles.

3778 Ševčuk, T. N.
(At the scientific research institutes of the people's Hungary).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 4 : 77–79. [Russian].
Maize. Of two double-cross dent hybrids MV5 and MV1 bred in Budapest, MV5 is highly productive and early and the other is resistant to lodging.
Sugar beet. V–S–53 and V–K–91, both bred at Sopronhorpács, are productive and resistant to *Cercospora*.
Tomato. New varieties from Kecskemét are reported. Kecskemét 363 is a fine canning variety, productive and resistant to drought. Kecskemét 42 produces bright-red fruits suitable for export on account of their high quality and good transportability.

3779 Åkerberg, E.
Växtförädlingen och vårt jordbruks utveckling. **(Plant breeding and the development of our agriculture).**
Sverig. Utsädesfören. Tidskr. 1956 : **66** : 337–48.
In this speech delivered at the annual meeting of the Swedish Seed Association, 31 July 1956, the breeding work of the association in recent years is reviewed and some of the best crop varieties developed are noted. Accounts of the work described have already appeared in *Plant Breeding Abstracts*.

3780 Wiklund, K.
Växtförädlingsproblem för Norrland. **(The problem of plant breeding in Norrland).**
Nord. JordbrForskn. 1956 : **38** : 18–19.
Problems to be dealt with by the new Röbäcksdalen substation of the Swedish Seed Association at Teg, Västerbotten, are outlined and include breeding early, hardy and disease-resistant crop varieties adapted to the Norrland region of Sweden.

3781 Statens stöd åt växtförädlingen m.m. Betänkande avgivet av 1953 års växtförädlingsutredning. (**State support of plant breeding etc. Report presented by the 1953 commission on plant breeding**).
Statens Offentliga Utredningar, Stockholm 1956 : No. 4 : Pp. 295.

This report of a commission appointed in 1953 to study the economic organization of plant breeding in Sweden includes an account of recent and current work on crop plants, vegetables and fruit trees at the various plant breeding institutes and a detailed discussion of a suitable means of financing plant breeding either directly by grants or indirectly through a system of royalties on sales of seed materials. The disadvantages of the latter method are held to outweigh the advantages. Questions of seed control and certification are also discussed.

3782 Holme Hansen, H. H.
Lokale forsøg og andre planteavlsarbejder. (**Local experiments and other plant cultivation work**).
Planteavl. Loll.-Falster. 1956 (1957) : 15–18.

Work carried out on Lolland and Falster, Denmark, in 1956 includes trials of clover strains and of oat, wheat and barley varieties. The new short-strawed Abed varieties of barley have shown promise (cf. Abst. 3879).

3783 Dorst, J. C.
Development and organization of the breeding of agricultural crops in the Netherlands.
Euphytica, Wageningen 1957 : **6** : 4–10.

An historical outline is given of the organization of breeding and of the inspection of crops and legal protection of breeders.

3784 Banga, O.
Horticultural plant breeding in the Netherlands.
Euphytica, Wageningen 1957 : **6** : 11–13.

A short historical account of the organization of vegetable, fruit and ornamental plant breeding is presented.

Zbornik I. Kongresa Biologa Jugoslavije, Zagreb 12–15 VII, 1953. (**Proceedings of the 1st Jugoslavian Biological Congress, Zagreb, 12-15 July, 1953**).
Glasn. biol. Sekc., Zagreb 1955 : Pp. 397.

3785 *Tavčar, A. Heterozis u teoriji i praksi.* (*Heterosis in theory and practice*). (*pp. 51–63*).

After examining the views on heterosis of Shull, East, Jones, Robbins and other research workers, the writer reports on his own hybridization experiments with dent maize inbreds. These experiments suggest that heterosis is caused by nuclear-cytoplasmic interaction. The standard methods for the production of hybrid maize using cytoplasmic male sterility are described.

3786 *Banić, S. Značaj adaptacije za pojavu rezistencije kod bakterija.* (*The nature of adaptation to resistance in bacteria*). (*pp. 96–99*).

Experiments on the resistance of *Staphylococcus aureus* to penicillin are reported which suggest that acquired resistance of microorganisms to chemicals and antibiotics is mainly adaptive and not a consequence of selection of spontaneous mutants.

3787 *Glavinić, R. Uporedivanje vegetativnih i polnih hibrida raznih sorata paradajza.* (*Comparisons between the vegetative and sexual hybrids of different tomato varieties*). (*pp. 155–60*).

An extended account of this report is referred to in Abst. 942.

3788 *Glavinić, R. Menjanje prirode pamuka promenom kompleksa spoljašnjih faktora.* (*Changing the heritable basis of cotton by altering a set of external conditions*). (*pp. 161–63*).

Krupna Čaura [Big Boll] was obtained at Skopje by subjecting a variety of *Gossypium hirsutum* to low temperatures and 12-hour days at the end of vernalization for several generations. It has the same growth period as the standard 182 in the Josifovo-Đevđelija region, but is more productive and has a longer fibre and higher ginning outturn.

3789 *Gornik, R. Vegetativni hibrid* Nicotiana glauca (Solanum lycopersicum). (*A vegetative hybrid of* N. glauca *with* S. lycopersicum). (*pp. 163–66*).

A description is given of the first seed generation of a vegetative hybrid between the tomato variety 47/47, itself a fourth-generation vegetative hybrid of tomato/*N. tabacum*, and *N. glauca*. The new tomato was earlier and more productive than 47/47 and possessed other valuable economic properties.

3790 *Jamšek-Korić, S. O suplementarnim klasićima kod pšenice.* (*Concerning supplementary spikelets in wheat*). (*pp. 188–90*).

By breeding and selection an unspecified soft wheat variety was caused to produce accessory fertile lateral spikelets; the new form is designated *Triticum vulgare* var. *tetrastichon*. Another

form obtained by hybridization had branched spikelets and yet another form had a few well-developed grains on supplementary spikelets borne below the main spikelets (cf. Abst. 3791).

3791 *Korić, M. Novi varijeteti pšenice dobiveni krizanjem.* (*New wheat varieties obtained by hybridization*). (*pp. 222–24*).

New forms of *Triticum vulgare*, some of which were referred to in Abst. 3790, are reported from Zagreb. (1) Var. *tetrastichon* is a four-rowed form with two equally well-developed productive spikelets at each articulation of the rachis. It has 18 pairs of spikelets, all bearing normal grains and a few single spikelets. Factorial analyses showed that the gene pair *čč* is responsible for the doubling of the spikelets, but it is only effective in the presence of the activator genes A_1 and A_2; without these *čč* causes semi-lethality or lethality. (2) Var. *ramosa* is analogous to *Triticum turgidum* var. *compositum* and has a similar arrangement of the ear and spikelets. Its branched ears and vigour are determined by the interaction of the genes *grgr*, A_1 and A_2. (3) Var. *floribunda* is characterized by an ear with many irregularly arranged florets, a high proportion of which are sterile. It resembles *Sorghum* rather than wheat. This form is available only in a heterozygous state. It is thought that the genes f_1, *gr* and *č*, are responsible for this form. (4) Var. *additiva* has normally developed ears with supplementary spikelets borne below the main spikelets. The supplementary spikelets are well-developed and have 2–3 normal grains. This character is tentatively attributed to two polymeric genes. (5) Var. *luxuriosa* surpasses all the above forms in vigour, number of spikelets and ear length by 50–100%. These characteristics might have been attributed to heterotic effects but they are heritable. In field experiments a single ear had 45 spikelets and bore up to 150 grains. (6) Var. *aurea* has yellow ears and culms and yellow-striped or yellow leaves. Breeding work involving vars. *tetrastichon*, *ramosa* and *luxuriosa* is in progress.

3792 *Sarić, M. Prilog proučavanju naslednih promena izazvanih kalemljenjem.* (*A contribution to the study of heritable changes induced by grafting*). (*pp. 313–18*).

The embryo of a six-rowed *trifurcatum* barley was transplanted on to the endosperm of a two-rowed barley of var. *nudum*. The F_0 was characterized by awns which varied in length and were arranged irregularly in the ear. The plants of the first seed generation differed from the initial forms with regard to the length and thickness of the awns, the hooded character and the number of rows.

3793 *Tavčar, A. Somatska mutacija endosperma tipa indurata na klipu* Zea mays indentata *i modus njezina nasljeđivanja.* (*Somatic mutation of endosperm from the* indentata *to the* indurata *type in* Z. mays *L. and the mode of its inheritance*). (*pp. 349–53*).

The occurrence at Zemun of flint grains in the ear of an inbred dent maize is attributed to somatic mutation.

3794 *Vitasović, Z. Neki problemi hibridizacije krumpira.* (*Some problems of potato hybridization*). (*pp. 371–72*).

Improvement of such varieties as Wohltmann and Early Rose by sexual hybridization involving the use of 2,4,5-T to better crossability is discussed.

3795 *Zečević, L. M. Prekobrojni hromozomi kod inbridnih linija* Zea mays *L. I. Ponašanje prekobrojnih hromozoma u prvoj mejotičnoj deobi kod linija* I_1 *generacije.* (*Supernumerary chromosomes in inbred lines of* Z. mays *L. I. The behaviour of the supernumerary chromosomes in the* I_1 *generation lines at the first meiotic division*). (*pp. 382–83*).

Supernumerary chromosomes, thought to belong to the category of B chromosomes, were observed in four lines of a maize inbred in the I_1. They were heterochromatic and smaller than the A chromosomes, with which they did not pair, and showed stickiness and reduced pairing at diakinesis. No division of B univalents occurred at anaphase I.

Institutul Agronomic "Nicolae Balcescu". Lucrările sesiunii ştiinţifice din 1–6 Februarie 1955. (**The Nicolae Balcescu Agronomic Institute. Transactions of the scientific session of 1-6 February 1955**), Bucureşti 1955 : Pp. 500.

3796 *Manoliu, M. Contribuţii la selecţia grîului de toamnă: obţinerea unei noi linii hibride de calitate superioară.* (*Contributions to the breeding of winter wheat: the production of a new hybrid line of superior quality*). (*pp. 23–38*).

The progenies of the hybrids Purcari x Hostianum, Kooperatorka x A15, A15 x Hostianum, Early Blackhull x Kooperatorka and Kanred HF x Kooperatorka were investigated. Special interest attaches to a line of the first-mentioned hybrid; it is characterized by superior baking quality and high yield.

3797 *Ceapoiu, N. & Itoafă, E. Contribuții la stabilirea tehnicii de educare a hibrizilor sexuați de cînepă.* (*Contribution towards establishing the technique of training sexual hybrids of hemp*). (*pp. 39–76*).

Cf. Abst. 3237.

3798 *Raicu, P. & Boldea, E. Cercetări asupra calității griuliu ramificat* (Triticum turgidum *L. var.* Plinianum *Körn*). [*Investigations on the quality of branched wheat* (T. turgidum *L. var.* Plinianum *Körn*)]. (*pp. 95–113*).

The baking quality of the branched wheat investigated was poor.

3799 *Crăciun, T. Observații asupra viabilității polenului și stigmatelor și asupra procesului sexual la porumb.* (*Observations on the viability of the pollen and stigmas and on the sexual process of maize*). (*pp. 115–32*).

This general study of the floral biology of maize includes observations on the fertilizing capacity of pollen of various ages and on the receptive capacity of the stigmas of various ages.

3800 *Chirilei, H. & Mavromati, E. Contribuții la studiul rezistenței la ger a cerealelor de toamnă.* (*Contributions to the study of the resistance of winter cereals to freezing*). (*pp. 133–45*).

The physiology of overwintering of a series of winter wheat varieties and one winter barley variety was investigated. Resistance to low temperature was correlated with a lower water content at the beginning of winter, a more rapid loss of water as winter advanced, a higher content of dry matter, water-soluble carbohydrates and ether-soluble substances and a more pronounced tendency for the protoplasm to withdraw from the cell walls (cf. *PBA*, XXVI, Abst. 2223 and XXVII, Abst. 1551).

3801 *Bordeianu, T., Lupescu, F., Mihăescu, G. & Popa, V. Cercetări asupra germinației polenului diferitelor soiuri de pomi.* (*Investigations on the germination of the pollen of different varieties of fruit trees*). (*pp. 161–74*).

Data are provided on the germinative capacity of the pollen of Rumanian varieties of apple, pear, medlar, plum and peach.

3802 *Neagu, M. I. Contribuții cu privire la stabilirea schemei de alegere clonala la vita de vie.* (*Contributions towards establishing a scheme for the clonal selection of the vine*). (*pp. 191–99*).

A scheme for organizing clonal selection is outlined.

3803 *Constantinescu, G. & Trandafir, A. Hibrizi noi proveniți din soiurile de Coarnă neagră și Bican.* (*New hybrids originating from the varieties Coarna neagra and Bican*). (*pp. 201–11*).

Two new vines have been obtained by open pollination of the above two female varieties respectively. They differ from the mother plants in being hermaphrodite and earlier.

3804 *Ionescu, M. & Popescu, S. O nouă metodă pentru stabilirea calității grînelor.* (*A new method for establishing the quality of cereals*). (*pp. 265–75*).

It is suggested that the quality of wheat samples should be assessed from flour yield (X) according to the formula $X = \frac{H \times (100-F)}{100}$, where H = the hectolitre weight of the grains and F = the content of foreign bodies.

3805 **General Report of the Chinese-American Joint Commission on Rural Reconstruction for the year ending June 30, 1956, Taipei, Taiwan** : No. 7 : Pp. 149.

Brief reference is made to breeding projects and variety trials involving sorghum, rice, sweet potato, jute, sisal, sugar beet, citrus fruits, pineapple, groundnuts, onions and soya bean.

Annual Report of the National Institute of Genetics, Japan 1955 (1956) : No. 6 : Pp. 102.

3806 *Oka, H.-I. Polygenic nature of the "gametic-development genes" in rice.* (*pp. 41–42*).

Cf. Abst. 581.

3807 *Oka, H.-I. Restriction of gene recombination in hybrid populations of rice.* (*pp. 42–44*).

A fuller version of this paper is summarized in Abst. 3011.

3808 *Oka, H.-I. Inheritance of several agronomic characters in a varietal hybrid of rice.* (*pp. 44–46*).

Heritability values and genetic correlations were determined in respect of heading date, number of panicles per plant, height, panicle length and number of grains per plant from F_0–F_3 data of the cross Pei-ku (an indigenous *indica* Taiwan variety) x Taichung 65 [a *japonica* rice of the Peng-lai (= Horai) group].

3809 *Oka, H.-I. Observations on natural populations of Formosan wild rice.* (*pp. 46–47*).

Wild rice is only found in Taiwan in the region of Patu. A brief account is given of the wide

variation shown by the Taiwan populations. The wild forms cross readily with cultivated rice and the F_1 shows no disturbance in chromosome pairing.

3810 *Takenaka, Y., Hu, C.-H. & Tateoka, T. Karyology of* Oryza sativa *L. I. Karyological studies on haploid rice.* (*pp. 47–48*).

In cytological studies of four haploid strains, the authors found up to three bivalents and two trivalents. Secondary association was also observed. It is inferred that the rice genome is composed of the following chromosomes: abcde a′b′c′d′e′a″b″.

3811 *Matsumura, S. Nullisomic dwarfs and tetrasomic giants in hexaploid wheat.* (*pp. 48–49*).

Further studies of the progeny of the *Triticum polonicum* x *T. spelta* cross referred to in *PBA*, XXVI, Abst. 2180 and XXVII, Abst. 1215 are reported. The c and f nullisomic dwarfs have been identified with Sears's nullisomics XVII and XVI, respectively. It is concluded, from investigations of the F_2 between the a–g dwarfs and *T. compactum* that the *compactum* gene *C* is on the e chromosome of genome D. Some correspondences are suggested between the supernumerary chromosomes in the 42-chromosome gigas offspring of the nullisomic dwarfs and Sears's nullisomic series.

3812 *Matsumura, S. & Sakamoto, S. Karyotypes of diploid Agropyron species.* (*pp. 49–50*).

Cf. *PBA*, XXVI, Abst. 2451.

3813 *Matsumura, S. & Sakamoto, S. Agropyron and related genera collected in Nepal.* (*p. 50*).

A brief note is presented on the morphology, cytology and distribution of *A. semicostatum, A. gmelini, A. striatum, Elymus dahuricus, E. sibiricus* and *Brachypodium sylvaticum* var. *lozoniense.*

3814 *Gotoh* [*Goto*], *K. Off-type plants observed in a wheat variety "Saitama No. 27".* (*p. 51*).

Strain D of Saitama 27 contains a high proportion of plants differing from the typical variety in respect of height and heading date.

3815 *Gotoh* [*Goto*], *K. Polygenic differences in agronomic characters among some local strains of a barley variety "Hakata No. 2".* (*p. 52*).

Cf. Abst. 2964.

3816 *Gotoh* [*Goto*], *K. Population structure of the barley variety, "Iwate Mensury No. 2".* (*pp. 52–53*).

Five populations of the above variety, three from northern and two from southern Japan, showed differentiation both between and within populations in respect of length and rachilla hairs (*S* v. *s*), pubescence of the leaf sheath (*Hs* v. *hs*), winter or spring habit (*Wh* v. *wh*) and heading date. Some correlations are noted between genotype and location.

3817 *Matsumura, S. & Fujii, T. Effect of X-rays on fertility and mutation rate in cereals.* (*pp. 53–55*).

The first section of this paper has been summarized from another source in Abst. 2747. The second section reports experiments on X irradiation of malting barley. Fertility decreased proportionally with dose. Chlorophyll aberrations appeared in the F_2.

3818 *Matsumura, S. Chromosome aberrations in Einkorn wheat induced by irradiation.* (*pp. 55–56*).

The anomalous relationship between wave length of X rays and frequency of induced chromosome aberrations referred to in Abst.1216 appears to have been largely due to erroneous dosimeter readings. Experiments with γ rays showed that they induced more chromosome aberrations than the corresponding dose of X rays.

3819 *Fujii, T. "Virido-albina" mutant in Einkorn wheat induced by X-rays.* (*pp. 56–57*).

Cf. Abst. 392.

3820 *Takenaka, Y., Hu, C.-H. & Shimoyama, K. Cytogenetic studies on the genus Nicotiana, VII.* (*pp. 58–61*).

Accounts of the cytology of seven of the interspecific hybrids described in this article are summarized in Absts. 3316 and 3317. Two other hybrids are mentioned: *N. debneyi* x *N. trigonophylla*, in which mainly univalents appear at meiosis, and *N. longiflora* x *N. langsdorffii*, with a modal bivalent frequency of 4_{II}. This latter observation differs from the findings of Avery and of Kostov concerning this hybrid (cf. *PBA*, IX, Abst. 808 and XVI, p. 374).

3821 *Takenaka, Y. & Tanaka, M. Cytogenetic studies on the genus Nicotiana, VIII. A haploid plant of* Nicotiana tabacum. (*pp. 61–62*).

A haploid plant of *N. tabacum* was obtained after pollination with X-irradiated pollen of *N.*

alata. One to three bivalents were formed at meiosis.

3822 *Sakai, K.-I., Iyama, S. & Saio, K. Genetical studies on the cherry-red leaf color in tobacco.* (*pp. 62–63*).
Significant parent-offspring correlations have been detected in respect of degree of post-harvest reddening of the leaf in tobacco strains.

3823 *Gotoh* [*Goto*], *K. The degree of heritability of five characters in egg-plant.* (*pp. 67–68*).
Cf. Abst. 3557.

3824 *Furusato, K., Ohta* [*Ota*], *Y. & Ishibashi, K. Polyembryony in citrus.* (*pp. 69–70*).
Polyembryony in Natsudaidai [Summer orange], *C. sulcata* and the Unshu (= Satsuma) mandarin was investigated. Embryo number was greater in old plants than in young and greater in branches on the north side of trees than those on the south side. Number of seeds per fruit and embryo number were not correlated. (Cf. Abst. 1229).

3825 *Furusato, K. & Suzuki, E. Parthenocarpy in* Citrus Natsudaidai. (*p. 70*).
One parthenocarpic fruit of Natsudaidai [Summer orange] was obtained after spraying with 2,4,5-T.

3826 *Furusato, K., Ishibashi, K. & Ohta* [*Ota*], *Y. Polyploid grape varieties.* (*pp. 70–71*).
A bud sport of Kyoho, Kyoho x Kyogei and Ishiharawase were found to be tetraploid ($2n = 76$); the large-berried variety Delaware is diploid.

3827 *Furusato, K. & Miyazawa, A. F_2 offspring of the hybrid between watermelon and colocynthe.* (*pp. 71–72*).
The course of meiosis in the F_1 of the above cross, mentioned in Abst. 1254, is normal. Extensive segregation of plant characters occurred in the F_2 and back-cross generations.

3828 *Matsumura, S. Production of triploid sugar beet seeds.* (*pp. 72–73*).
Data are provided on the frequency of $2x$, $3x$ and $4x$ offspring in mixed sowings of $2x$ and $4x$ seeds and on the sugar yield of plant populations obtained from such mixed sowings.

3829 *Tateoka, T. Karyotaxonomic studies in Poaceae, III.* (*pp. 73–74*).
The morphological similarities between *Brachypodium sylvaticum* (18 small chromosomes) and *Agropyron yezoense* (28 large chromosomes) are not reflected by the caryotypes. Chromosome numbers of representatives of *Asperella, Briza, Bromus, Chikusichloa, Cynosurus, Festuca, Lolium, Lophatherum, Melica, Oplismenus, Panicum, Paspalum, Phragmites, Phyllorachis, Poa, Setaria, Sieglingia* and *Uniola* are given. (Cf. Abst. 1255).

3830 *Abe, Y. & Gotoh* [*Goto*], *K. Genetic control of acylation of anthocyanin pigment in eggplant.* (*pp. 75–76*).
Genetic analysis of the F_2 of the cross Burma x Black Beauty has shown that acylation of the anthocyanin molecule, which occurs in Burma but not in Black Beauty, is determined by a single dominant gene.

3831 *Sakai, K.-I. & Utiyamada* [*Uchiyamada*], *H. Chromosome number, hybridity and competitive ability in rice.* (*pp. 78–79*).
The competitive abilities of a series of *indica* and *japonica* varieties, their $4x$ derivatives and $2x$ and $4x$ hybrids between them were determined by mixed planting with Norin 29 [Ministry of Agriculture and Forestry 29] and measuring the top weight and number of panicles produced of the latter. It was found that chromosome doubling depressed competitive ability while hybridization increased it.

3832 *Sakai, K.-I. Further note on the effect on competition of a varying number of competing and noncompeting individuals.* (*pp. 79–80*).
A further series of experiments, in which a plant of one variety, rice or barley, was surrounded by 0–6 plants of another variety of the same species, is described (cf. Abst. 1245). The results confirmed the previous conclusions.

3833 *Sakai, K.-I. & Hiraizumi, Y. Possible establishment of an equilibrial state due to competition in mixed populations of autogamous plants.* (*pp. 80–82*).
Formulae are derived for possible equilibria between two genotypes differing in propagative capacity and competitive ability.

3834 *Sakai, K.-I. Competition between autotetraploids and their diploid prototypes in* Nicotiana tabacum *L.* (*p. 82*).
Mixed sowing of $2n = 4n$ strains of tobacco varieties showed that the tetraploids are at a competitive disadvantage compared with the diploids.

3835 *Oka, H.-I. & Sakai, K.-I. Variation in competitive ability among varieties and hybrid strains of rice.* (*pp. 83–84*).
Investigations of the competitive abilities of a series of Far Eastern varieties have shown that competitive ability is generally high in *indica* varieties while ranging from low to high in

japonica varieties. Comparison of F_{10} strains of pedigree and bulk-propagated cultures of the same set of crossings showed that competitive ability was higher in the bulk cultures, possibly as a result of selective pressure.

3836 *Oka, H.-I. & Sakai, K.-I. Variation in competitive ability of rice varieties appearing in response to the method of growing.* (*pp. 84–85*).

A mixed culture of Taichung 65 and Pei-ku was grown for three generations under four different sets of cultural conditions in Taiwan to illustrate the formulae for the effect of competition on frequency referred to in Abst. 1247. It appeared that the competitive capacity of Taichung 65 was inversely correlated with favourable environment.

3837 *Tsujita, M. & Matsui, C. Studies on a doubly lysogenic strain of* Pseudomonas solanacearum. (*p. 87*).

The studies referred to in Abst. 1260 were continued. The origin of a new phage type by superinfecting T–c200 phage with the S–10 (S–9) strain is attributed to phage recombination at the prophage stage.

3838 *Tsujita, M. & Matsui, C. Studies on the lysogenicity of* Pseudomonas solanacearum: *removal of lysogenicity of the bacterial strain T–c200 by ultra-violet irradiation.* (*pp. 87–89*).

The effects of ultraviolet irradiation in inactivating T–c200 phage and removing the lysogenicity of the bacterial strain are described. The interpretation of the curves obtained is uncertain.

3839 *Sakai, K.-I. Index for individual selection in autogamous plants on the basis of individual measurements, line means and line-group means.* (*pp. 90–92*).

Cf. Abst. 2499.

3840 *Oka, H.-I. Formulas for estimating the effect of one chromosome on a quantitative character by the so-called "reciprocal-translocation method".* (*pp. 92–93*).

Formulae are derived for the mathematical relationships between the quantitative effects of a gene pair *Aa* involved in a reciprocal translocation, the recombination value between *Aa* and the interchange point and the distribution of genotypes between fertile and sterile plants in the F_2 and F_3.

3841 *Kimura, M. Solution of a process of random genetic drift with a continuous model.* (*pp. 93–94*).

Cf. *PBA*, Abst. 37 and XXVI, Abst. 838.

3842 *Kimura, M. Genic selection in a finite population (interaction between genic selection and random genetic drift).* (*pp. 96–97*).

Cf. Abst. 1061.

3843 *Kimura, M. Rules for testing stability of selective polymorphism.* (*pp. 97–98*).

Cf. Abst. 55.

3844 **Annual Report of the Indian Council of Agricultural Research for 1953-54** (1956) : Pp. 189.

Brief reports are included of breeding and trials of sorghum, cardamom, custard apple, papaya, pulses and sweet corn.

Wheat. Tests to determine the reaction of a number of varieties and hybrids to *Puccinia* spp. have continued and breeding for improved resistance is under way. A number of new rust-resistant hybrids produced in Madhya Pradesh have proved promising in field trials.

Maize. Data from the inbreeding of selected plants in the Punjab have shown that with some characters homozygosity is achieved more quickly than with others and that inbred progenies show different responses to successive selfing, some lines showing homozygosity for major agronomic characters after only a few selfings. Trials and breeding have continued in Uttar Pradesh, Hyderabad and West Bengal.

Pennisetum typhoideum. At the Agricultural Research Station, Kavilpatti, 26 new hybrids between early-generation inbreds were produced and inbreeding of all desirable selections has continued. Some hybrids have shown promise in field trials.

Rice. It has been found that Chinese varieties, although otherwise well adapted to Kashmir, shed some grain during harvest. In Madras, trials to test varietal response to *Piricularia oryzae* and *Fusarium moniliforme* var. *majus* have been carried out and other states have carried out trials of their own and introduced varieties. At the Central Rice Research Institute, Cuttack, further crosses between *japonica* and *indica* varieties have been made and some F_1 plants back crossed to their *indica* parents.

Sweet potato. It is reported from Travancore-Cochin that all the sweet-potato varieties had a chromosome number of $2n = 90$ while other species of *Ipomoea* studied had $2n = 30$ or $2n = 60$. No success was achieved in attempts to cross *I. paniculata* ($2n = 30$) and *I. batatas* ($2n = 90$).

Mango. At the Government Fruit Research Station, Saharanpur, a number of crosses have been made between Dasehri and Romani with a view to combining the regular bearing habit

of the latter variety with the quality of the former. Further breeding has also been carried out at the Hyderabad Fruit Research Station.

3845 **Annual Report of the Department of Agriculture, Nyasaland Protectorate, for the year 1955/6** (1957) : Pt. 2 : Pp. 96.

Maize. Flint or semiflint inbreds with such characters as good combining ability, weevil resistance as the result of well-developed husks and resistance to *Helminthosporium turcicum* and lodging have been developed.

Of the single hybrids tested, combinations between local inbreds and lines supplied by the Rockefeller Institute in Mexico yielded well and had the ear characters desired. Some hybrids of local inbreds only equalled these combinations. Breeding for resistance to *Puccinia sorghi* continued.

Cotton. Strains of Albar 51 gave promising yields; in spinning quality they were intermediate between CLB and CL20. Progenies derived from selections of panmixis bulks of Albar 49 x CL20 and Albar 49 x BP52 x CL20 were selected for lint index. Breeding for bacterial blight resistance is to be based on this material and on a new series of crosses involving strains of Albar 51.

3846 **Report of the Governing Body and the Principal's Report of the Imperial College of Tropical Agriculture, St. Augustine, Trinidad for 1955-56** (1957) : Pp. 55.

Cacao. Study of crosses between ICS clones of local Trinitario continued. Possibly cuttings of certain of the clones may be more efficient producers than seedlings from crosses involving the same clones. Observations on crosses of ICS clones with the witches'-broom resistant clones SCA6 and SCA12 suggested that so far as resistance to this disease is concerned the former of these Upper-Amazon clones is the better parent. Cytological investigations on the inheritance of self incompatibility continued. *Herrania* spp. have been crossed.

Banana. Male parents developed from 2*n* cultivars collected in British East Africa in 1948 were used in Jamaica for the first time. So far only one family, derived from the 2*n* variety Sikuzani, has included valuable seedlings. Bud pollination has possibilities as a means of increasing seed yields of edible bananas and thus increasing the efficiency of the final stage of breeding. A general survey of ♀ sterility in edible varieties was completed. Collections made on the 1954–55 expedition to south-east Asia and Queensland were classified (cf. Abst. 3449). Work was also carried out on cytogenetic interspecific barriers, particularly in sect. *Rhodochlamys*, and on structural chromosomal hybridity within *Musa accuminata*.

3847 **Annual Report of the School of Agriculture of the North Carolina State College, 1955** : Pp. 32.

Tobacco breeding has continued and a new maize hybrid has been released. The latter, designated NC46, is a yellow hybrid with superior lodging resistance, equalling other early maturing hybrids in yield.

3848 **Sixty-eighth Annual Report of the Tennessee Agricultural Experiment Station, 1955** (1956) : Pp. 76.

Oats. The crown-rust resistant winter selections Tenn. 53–12 and Tenn. 53–24 outyielded all other varieties tested.

Rye. Colchicine treatments were carried out to double the chromosome number in order to facilitate crossing.

Barley. The hooded winter strain 50–112–38 was superior in yield to all the awned varieties tested. A search is being made for radiation-induced mutants resistant to *Helminthosporium sativum*. Colchicine was used to double the chromosome number prior to hybridization.

Forage legumes. In breeding crimson clover for resistance to shattering, prolongation of the vegetative period and increased dormancy of the seed, use has been made of γ radiation, colchicine and selection of local collections. Red-clover selections highly resistant to southern anthracnose were obtained.

Colchicine treatment and γ radiation were also applied in breeding lespedeza and vetch.

Tobacco. Breeding was concentrated on the dark fire-cured type 22, of which it is hoped to develop disease-resistant, commercially acceptable lines. Burley 21, resistant to wild fire, mosaic and black root rot, was released (cf. *PBA*, XXVI, Abst. 229).

Tomato. Breeding for combined resistance to buckeye rot, late blight and other diseases continued.

3849 **Agricultural Research in South Dakota. Sixty-Ninth Annual Report of the South Dakota State College Agricultural Experiment Station, July 1, 1955 to June 30, 1956** : Pp. 168.

Brief reports are given of progress made in breeding wheat, oats, maize, barley, sorghum, forage grasses, apple, pear, apricot, raspberry, grape, tomato and soya bean. Other notes include a description of Chinkota elm, a hardy selection from the Siberian elm, and popular

articles on vegetable breeding, foundation seed production and the breeding of creeping lucerne.

3850 **Agricultural Report of the North Dakota Agricultural Experiment Station 1956** (1957) : Bull. No. 405 : Pp. 44.

Breeding has continued with Sudan grass, sweet clover, fruit crops, cabbage, broccoli and squash and the results of varietal trials with the following crops are briefly reported: wheat, oats, barley, forage grasses, lucerne, sweet clover, potato, sweet pepper, strawberry, onion, water melon and sweet corn.

Wheat. Screening for resistance to stem rust race 15B has continued and a number of selections combine resistance with high yield and other desirable agronomic characters. One of these selections, previously known as ND1, has been released under the name of Conley. It is outstanding in respect of milling and baking quality and has particularly high dough strength. Milling and baking tests of named varieties and new hybrids continued. Differences have been found in the peptide content of two durum varieties, PI94701 which is rust resistant and Carleton which is rust susceptible.

Oats. Ransom, an early-maturing variety, was released in 1956 for use in the south-eastern section of North Dakota. It does not give very high yields and its chief value lies in its resistance to all known races of *Puccinia graminis* var. *avenae* and moderate resistance to *P. coronata*.

Barley. Traill was released during 1956 (cf. *PBA*, XXVI, Abst. 3307).

Potato. Controlled crosses and self pollinations have been made using, as parents, selections and varieties possessing a high degree of resistance to *Streptomyces scabies*, *Phytophthora infestans* and viruses X and Y and progeny from earlier crosses have undergone field and greenhouse trials at several localities in North Dakota. The advanced red-tubered selection ND2906–1R has continued to do well, possessing moderate resistance to *S. scabies*, early maturity, good tuber type, high yield and good culinary qualities. Chipping tests indicate that the red-tubered selection ND2774–3R is of excellent quality, followed by ND2906–1R and ND2555–12R, all these selections being superior to the standard variety, Cobbler.

Flax. In a serological investigation of protein fractions of selected flax varieties and races of flax rust, distinguishing antigenic substances were found, all races and varieties being antigenically distinct although some of the substances were found to be shared among races, among varieties and among both races and varieties.

Strawberry. The blossoms of selections which include *Fragaria virginiana* in their parentage were not damaged by low temperatures during May 1956 although the pistils of many named varieties were killed.

Tomato. Breeding of early-maturing tomatoes has continued and analysis of material selected for high ascorbic acid content has shown that the better selections contain from 30·1 to 51 mg. of ascorbic acid per 100 g. Selection 728–1–1–1–1–1, in the Early Chatham maturity class, has exceeded all other varieties in both early and total yield and has an average fruit size one third larger than that of Early Chatham.

3851 Departement van Landbouw, Veeteelt en Visserij, Suriname. Jaarverslag over 1954. (**Department of Agriculture, Animal Husbandry and Fisheries, Surinam. Annual report for 1954**). 1957 : Pp. 124.

In addition to the work described below, varietal trials of sorghum, citrus fruits, groundnut, cabbage and lettuce have been carried out.

Rice. The crosses Géant [Giant] x Holland-VD50208 x Géant and (Géant x VD5096) x Holland have been effected and progenies from earlier crosses have undergone trial. The new variety Dima was released (cf. *PBA*, XXV, Abst. 2015).

Cacao. No witches' broom occurred upon clone LP1 after inoculation with spores of *Marasmius perniciosus*, although a few of the inoculated buds died. Seed from two crosses of G8 x DR38 has been sown.

Cowpea. Selection for uniformity of ripening is being carried out.

3852 **Eighth Annual Report of the Commonwealth Scientific and Industrial Research Organization of the Parliament of the Commonwealth of Australia for the year 1955-56** : Pp. 179.

General genetics. Biochemical and physiological mutants induced by radiation were studied in *Arabidopsis thaliana*. Varietal differences in vitamin synthesis were shown by this species.

The theory of trisomic inheritance was developed. The application of diallel crosses in problems of quantitative inheritance received attention.

Grasses. Chromosome numbers were counted in 28 *Danthonia* spp. Breeding systems and the nature of barriers to crossing within this

genus are being studied. Self fertilization is usual but some natural crossing occurs.

Distribution of chromosome races in kangaroo grass (*Themeda quadrivalvis*) is under investigation.

Relationships between *Phalaris* spp. are being determined. Evidence of natural hybridization between *Ph. truncata* and *Ph. brachystachys* was obtained from introduced material. Perennial and annual segregates are being selected from allopolyploid *Ph. tuberosa* x *Ph. minor*.

Scope for selection of types with little or no cyanogenetic glucoside exists in *Sorghum almum*.

Variation in *Setaria* and *Digitaria* gives opportunity for selection of strains for winter production. The possibility of developing allopolyploids is being explored.

Synthesis of a nonshedding strain of *Ehrharta calycina* by means of the polycross test is proceeding.

Seedlings of *Paspalum dilatatum* and *P. commersonii* were treated with 10,000–20,000 r. in an attempt to induce useful variants.

Lucerne. Pollen germination and pollen-tube growth in *Medicago sativa* were markedly stimulated *in vitro* by glutamine.

Transfer of the creeping habit of Siberian lucerne to Australian strains has been initiated.

Rhizomatous selections are being intercrossed to develop populations for selection under grazing in south-eastern Queensland.

Clovers. In subterranean clover, mixtures of strains and mixtures of hybrids are being compared to assess the value of hybridization as a means of developing strains adapted to new environments. The impact of natural selection upon morphological and physiological characters in the hybrid mixtures is also being investigated. Data on intervarietal compatibility suggest that subspeciation has occurred independently in different regions. Time of flowering proved to be a polygenic character, with strong heritability. Strains of Mediterranean origin displayed wide variations in seed dormancy as affected by temperature. Varietal differences were found in respiration rate. Subterranean clover has proved to be genetically homogeneous in nitrogen-fixing capacity. Most bacterial strains, whether ineffective or effective, produce the same amount of nodular tissue. Divergence among a few strains in production of such tissue may be simply inherited.

In white clover, physiological and biochemical characteristics of clines for leaf marking and cyanogenetic glucoside are being analysed.

Ineffective nodulation due to a recessive gene in red clover is associated with proliferation of infected host cells. Another gene is concerned with failure in bacteroid formation.

Other forage legumes. Some species and strains of subtropical introductions proved to be resistant to little-leaf virus.

Phaseolus lathyroides, *Indigofera endecaphylla*, *Desmodium uncinatum*, *Stylosanthes gracilis* and *Leucaena glauca* are self compatible but require high humidity for pollen-tube growth in the stigma. *Ph. lathyroides* and *S. gracilis* are cleistogamous; in the other species some natural cross pollination is possible.

Seedlings of *Ph. lathyroides* and *I. endecaphylla* have been exposed to 10,000–20,000 r. of X rays; in the last-mentioned species a mutant low in content of β-nitropropionic acid is desired. Hybridization of this species with *I. retroflexa* and *I. tettensis*, which are free from this compound, has been attempted.

Early, midseason and late-flowering types of *L. glauca* have been distinguished. The last two are taller, less branched and winter green. They have been crossed with the early, freely seeding type.

Tobacco. In breeding for blue-mould resistance in flue-cured tobacco, *N. goodspeedii* crosses have been the most resistant, although the degree of resistance has tended to decline with each successive back cross. When the BC_1 of *N. goodspeedii* ♀ x *N. tabacum* ♂ was used as ♀, the BC_2 developed male sterility. With flue-cured varieties as ♀ parents and the back cross as ♂, very few viable seeds were secured from the BC_2 and most of the plants died before flowering. Other varieties of *N. tabacum* are being tried as ♀ in back crossing. Two lines of *N. debneyi* parentage from the USA are being further back-crossed with *N. tabacum*. One includes plants resembling *N. debneyi* which are resistant to blue mould. The other is readily infection by blue mould which causes severe leaf distortion, but on some plants spore production is slight. So far no resistant mutants have been induced by radiation of pollen and seeds.

Linseed. Some introductions and Punjab x Walsh selections were superior in yield to these parent varieties and field-resistant to rust.

Soya bean. A single-gene mutation, causing resistance to nodulation, has been discovered (cf. Abst. 4607).

3853 **Biennial Report of the Hawaii Agricultural Station, 1954-56** (1956) : Pp. 62.

Passion fruit. This fruit proved to be self

sterile, a high degree of incompatibility also being found among vines of the same parentage.

Papaya. Hybrid strains bearing fruits at a conveniently low level and earlier in fruiting than Solo show promise for the fresh market or processing.

Onion. The short-day variety Red Creole is well adapted in Hawaii but splits badly. Selection so far has reduced the percentage of splitting from 97·7 in the original accession to 47·0.

Cauliflower. A strain of Pua Kea comparatively free from premature curd formation as the result of sudden change from cool to warm weather has been selected (cf. *PBA*, XXV, Abst. 876).

Cucurbits. Water-melon crosses have been effected to combine good quality with resistance to wilt, anthracnose and mosaic. In musk melon, powdery-mildew resistant Georgia 47 has been crossed with two Mediterranean types noteworthy for their quality and large fruit size. A productive, early and mosaic-resistant line of cucumber has been crossed with accessions bearing darker green fruits.

Tomato. Early-maturing lines resistant to nematode root-knot and fruit cracking have been developed which have produced high-yielding F_1 hybrids when combined with varieties susceptible to root knot but otherwise commercially desirable. Root-knot resistance depends upon a major dominant gene in linkage group IV. Lines possessing resistance to both root knot and bacterial wilt have also been secured. Genes for male sterility are being used to facilitate the production of F_1 seed.

Pea. Powdery-mildew resistance has been introduced into lines of the Chinese edible-podded pea.

3854 DE HAAN, H.
Pioniers onder de Nederlandse kwekers. **(Pioneers among Netherlands breeders).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1957 : **14** : 8–9.

A brief account of the work of 19th century plant breeders in the Netherlands is presented.

3855 BRINK, R. A.
Genetics and plant breeding.
Science 1957 : **125** : 507–08.

An account is given of the symposium on Genetics in plant breeding held during May 1956 under the auspices of the Biology Department, Brookhaven National Laboratory, Upton, NY.

3856 NYBOM, N.
Växtförädling med hjälp av inducerade mutationer. **(Plant breeding with the aid of induced mutations).**
Sverig. Utsädesfören. Tidskr. 1957 : **67** : 34–55.

Among the topics discussed in this review are: (1) the types and rates of mutation induced by different radiations and chemical treatment, with special reference to barley; (2) some of the improved agronomic characters induced by mutagenic treatment in various cereals, grasses, legumes, oil crops, fibre plants and horticultural crops; and (3) the difficulties arising through intrasomatic competition in which the mutant cells may be eliminated through the more rapid growth of the unchanged tissue, an effect that occurs less readily after neutron irradiation than after treatment with X or γ rays. A table showing suitable X-ray doses for the induction of mutation in dormant seeds and other plant parts of various crops is included.

3857 **Report of the first meeting of the European Contact Group on the uses of isotopes and radiation in agricultural research held in Wageningen, Netherland 10-14 December 1956** : FAO Meeting Report No. 1956/27 : Pp. 39. (Mimeographed).

The report includes a short survey of achievements and current projects in the use of various types of radiation in crop breeding in European countries.

3858 BROCK, R. D.
Mutation plant breeding.
J. Aust. Inst. agric. Sci. 1957 : **23** : 39–50.

The potentialities of employing ionizing and ultraviolet radiation and chemicals as means of securing economically useful variations are evaluated on the basis of a survey of research in the USA, Sweden and other countries.

3859 KEPPLER, E.
Züchtungsmethodische Untersuchungen an Populationen zweier Selbstbefruchter *Pisum sativum* L. und *Triticum aestivum* L. **(Investigations relating to breeding methods on populations of two self-fertilizers, *P. sativum* L. and *T. aestivum* L.).**
Kühn-Archiv 1956 : **70** : 538–39.

The results reported in this dissertation show that heterosis was often detectable in the F_1 generation from crosses of two pea varieties; there was no correlation between the yield of F_1 and F_2 populations but a high correlation between those of the F_2 and F_4. The average

yield of a population was not always correlated with that of the progenies of selected plants.
In winter-wheat crosses the correlations between the yields of one generation and the next were high but in spring wheat they were lower; for baking quality the correlation was higher.
Attempts to increase ear size in spring wheat by selection in the F_2 and F_3 were without effect; selection in garden peas produced a slight increase in number of pods per plant but no increase in resistance to *Ascochyta pinodella* .

3860 Korte beschrijving van de nieuwe rassen, welke in 1957 op de interprovinciale proefvelden worden beproefd en niet voorkomen in de 32ste beschrijvende rassenlijst voor landbouwgewassen 1957. **(Short description of the new varieties which were tested on the interprovincial trial fields in 1957 and do not appear on the 32nd descriptive variety list of agricultural crops, 1957).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1957 : **14** : 10, 13–14.

Brief information is presented on the parentage and chief characters of eight winter wheats, four winter barleys, six winter ryes, three winter rapes, four summer wheats, 13 summer barleys, 17 oat varieties, five maize varieties, three peas, six beans, four flaxes, one poppy and 12 potatoes tested in 1957 but not included in the descriptive variety list (cf. p. 761).

3861 Zhukovsky [Žukovskiĭ], P. M.
Die Entstehung der Kulturpflanzen. **(The origin of cultivated plants).**
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 23 : Pp. 33.

The history of cultivated plants is considered to have had its beginnings in the collection of wild plants such as *Zizania aquatica, Agryophyllum arenarium, Trapa natans,* acorns and many wild fruits. The mountain centres of development are regarded as the primary ones and valley cultures such as the Mesopotamian, Indian and Chinese as secondary. The role of selection in increasing fruit size and removing undesirable characteristics of the wild ancestors is explained.
A long list of plants whose origin goes back to prehistoric times is given, whereas *Hevea,* sugar beet and kok saghyz are named among the most recent.
China is the most important centre of origin and the species that have originated there are enumerated. Similar information is then given for other centres. *Ipomoea batatas* is named as the only plant species known to have migrated from America to Melanesia and Polynesia in pre-Columbian times; *Lagenaria siceraria* is thought to have reached Polynesia independently, possibly from Africa, somewhat later. Conversely, the coconut is named as a species that migrated from tropical Asia to America in pre-Columbian times.
The characteristics of primitive wheats are illustrated by *Triticum aegilopoides, T. urartu, T. chaldicum, T. dicoccoides, T. timopheevi, T. macha, T. tubalicum* and *T. imereticum,* and mention is made of the production, in crosses of some of these species, of forms identical with bread wheat, *T. aestivum.* Rice cultivation is regarded as having arisen in the Himalayas, that of maize in Mexico; the primitive maize is said to have had hermaphrodite flowers and these have appeared in a number of crosses, e.g. Minnesota 13 Extra x Odessa Gruševskaja; the difficulties of the hypothesis of Mangelsdorf and Reeves are mentioned and the view that the genera *Zea, Euchlaena* and *Tripsacum* have originated independently is thought more probable.
Some of the valuable characters of the primitive potatoes of South and Central America are mentioned, though many of the species described are considered to be of doubtful taxonomic validity; the conflicting opinions of Bukasov on the one hand and Salaman and Hawkes on the other, concerning the origin of the domestic potato, are reported.
Sugar beet is traced back to crosses of *Beta vulgaris* and *B. maritima,* sunflowers to the wild Mexican species *Helianthus lenticularis,* its development as an oil crop having begun in Russia in the early nineteenth century; modern varieties with 63·4% oil in the seeds, yielding over a ton of oil per ha., and others resistant to *Puccinia helianthi* and *Plasmopara halstedii,* are cited. In connexion with the origin of *Cucurbita* reference is made to the recent work of Whitaker (cf. Abst. 928). Cultivated cottons are thought to have arisen direct from the wild species, and reference is also made to the discovery of wild *Cocos nucifera* in the Palmyra archipelago by Beccari. Finally the role of interspecific crossing in the origin of such species as *Nicotiana tabacum, N. rustica* and the domestic plum is mentioned.

3862 Eigsti, O. J.
Induced polyploidy.
Amer. J. Bot. 1957 : **44** : 272–79.

General progress achieved in producing economically valuable polyploids of various crops by

colchicine treatment is assessed and the principles involved in breeding by polyploidization are outlined.

3863 Sakharam Rao, J.
A caution against possible sterility due to vegetative propagation in horticultural and other crops.
Madras agric. J. 1957 : **44** : 140–43.
Examples are given in support of the contention that vegetative propagation has adverse effects upon fertility. This method should be used with caution in the case of crops in which the seeds are the desired products. Comparative studies of the effects of seed and bulb propagation upon pollen fertility should be made in such crops as onion and garlic.

3864 Miyamoto, T.
The germination inhibitor in sugar beet seed balls.
Quart. Bull. Mich. agric. Exp. Sta. 1957 : **39** : 518–23.
This article includes details of the oxalic acid content of varieties of diploid, triploid and tetraploid sugar beet, fodder beet and spinach as determined at Hokkaido University, Japan.

3865 Lichte, H.-F.
Über die Physiologie von Angiospermpollen und ihre Bedeutung für die Pflanzenzüchtung. (**On the physiology of angiosperm pollen and its importance for plant breeding**).
Angew. Bot. 1957 : **31** : 1–28.
It is shown that the germination of the pollen of many species after storage in a desiccator at room temperature may be improved by placing the pollen in a saturated atmosphere for a few hours before testing for germination. A few species showed no decrease in germinating capacity after dry storage and did not require subsequent damp treatment. Fresh pollen stored at —183° or —78° C still retained normal germinating capacity after 14 months in most species but in some cases, notably the Gramineae, preliminary drying treatment before freezing was necessary. Pollen stored at these temperatures was effective in pollination and gave normal progeny, storage at —78° C. being most practicable and hence most likely to be useful in breeding. When stored at —4° C. pollen decreased markedly in germinating power after four months. It is shown that maximum germination in different species depended on both storage treatment and germinating medium, the addition of boron to the latter generally being advantageous.

Lantbruksveckan 1956 (**Agricultural Week, 1956**).
Styrelsen för Stiftelsen Svenska Lantbruksveckan 1956 : Pp. 231.

3866 *Nilsson-Leissner, G. Om introduktion av nya kulturväxter i landtbruket. I.* (*On the introduction of new crop plants in agriculture. I.*). (*pp. 89–99*).
After an account of the activities of the Division of Plant Exploration and Introduction in the USA and of the Section for Plant Introduction of the Division of Plant Industry in Australia, a plea for systematic plant introduction and testing in Sweden is put forward.

3867 *Åkerberg, E. Om introduktion av nya kulturväxter i lantbruket. II.* (*On the introduction of new crop plants in agriculture. II*). (*pp. 99–106*).
The desirability of a wider scale of plant introduction into Sweden as a means both of agricultural production of industrial crops and of obtaining material for use in plant breeding is urged, examples being given of introduced crops which have proved useful for these two purposes.

3868 Hodge, W. H. & Erlanson, C. O.
Federal plant introduction—a review.
Econ. Bot. 1956 : **10** : 299–334.
A detailed historical survey is given of the organization and activities of the Section of Plant Introduction of the US Department of Agriculture.

3869 Gindel, J.
Acclimatization of exotic woody plants in Israël : the theory of phytoplasticity.
Mater. veg. 1957 : **2** : 81–101.
After discussing the factors affecting acclimatization, particularly temperature and rainfall, as observed at Rehovot, Israel, the author concludes that successful acclimatization is determined by the ability of introduced plants to survive exceptional seasons. A theory of phytoplasticity is proposed which suggests that (1) every plant possesses, to a greater or lesser degree, the ability to change its metabolism to conform with changes in the environment, such metabolic changes resulting in physiological and morphological changes and (2) evolution in the process of acclimatization is expressed by the increased adaptation of morphological, histological and anatomical structure and of the period of physiological activity. Continuous selection of individuals showing the greatest plasticity, that is ability to adapt, occurs while acclimatization is taking place.

3870 Dixon, G. E.
Crop ecology and plant breeding for disease resistance.
Nature, Lond. 1957 : **179** : p. 765.

An account is given of the conference held in January 1957 at Muguga, Kenya, to consider problems of crop ecology and breeding for disease resistance in East Africa. Contributions to the latter topic included the following. G. M. Wickens illustrated the need for a research pathologist in breeding projects by reference to work on diseases in cotton. H. C. Thorpe dealt with difficulties recently encountered in breeding wheat for stem-rust resistance in Kenya. Coffee rust and the work of the special rust research station at Lisbon were reviewed by R. W. Rayner. In discussing the status of tropical maize rust in East Africa, H. H. Storey showed how research and breeding initiated before the disease reached East Africa provided local maize with genes for resistance derived from Central-American introductions.

3871 Fischer, W.
Radioisotope in Phytopathologie und Pflanzenschutz. (**Radioisotopes in phytopathology and plant protection**).
NachrBl. dtsch. PflSchDienst., Stuttgart 1957 : **9** : 88–94.

In the section on mutations in this general review, reference is made to the production of oat mutants resistant to stem and crown rust by the use of irradiation (cf. Abst. 3758).

3872 Okabe, N. & Goto, M.
(**Studies on the strains of *Erwinia carotovora*. I. The antigenic structure of the flagella and its relation to pathogenicity and maltose fermentation**).
Shizuoka Daigaku Nogakubu Kenkyu Hokoku/Bull. Fac. Agric. Shizuoka Univ. 1956 : No. 6 : 16–32. [Japanese].

Some 180 isolates were classified into 70 strains and 12 groups by means of serological studies of the flagellar antigens. Some correlations were noted between serological strain and host range and specificity.

3873 Waksman, S. A.
Species concept among the Actinomycetes with special reference to the genus *Streptomyces*.
Bact. Rev. 1957 : **21** : 1–29.

Evidence is presented to show that the Actinomycetes are more closely related to the bacteria than to the higher fungi. The morphological, cultural, biochemical and other properties used in the characterization and description of species of *Streptomyces* are discussed and some problems of speciation illustrated by an analysis of the history and present status of several *Streptomyces* species, including *S. griseus* and *S. scabies*.

3874 Snyder, W. C., Hansen, H. N. & Oswald, J. W.
Cultivars of the fungus, Fusarium.
J. Madras Univ. 1957 : **27** : 185–92.

It is suggested that the employment of cultivar names should prove useful in industrial mycology and crop pathology. Giving the adoption of such names in the case of *F. roseum* as an example, it is pointed out that cultivars of such a pathogen are in fact the direct result of man's selective action in cultivation and it is therefore appropriate to use this method of identification in crop pathology.

3875 Müller, H.-J.
Zur Problematik der Blattlausresistenz landwirtschaftlicher Kulturpflanzen. (**The problems of aphid resistance in agricultural crop plants**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 27 : Pp. 20.

The role of ecological factors in determining the interrelationships between the life cycles of aphids and host plants is emphasized; different types of resistance and pseudoresistance are analysed and certain cases in which resistance can be ascribed to some morphological feature such as hairiness are cited; very rarely the presence of a toxic substance or a lower content of some nutrient has been demonstrated in resistant varieties.

Experiments with two varieties of field bean, *Vicia faba* 'Rastatter', known to be highly resistant to *Aphis fabae*, and *V. faba* 'Schlandstedter', known to be susceptible, are described. In continuous breeding tests started in 1948, after 2925 days 381 parthenogenetic generations of the aphid were produced on the resistant variety and 387 on the susceptible, a difference too small to account for the difference in attack in the field. On the other hand daily counts of the number of aphids on the plants of the two varieties growing in adjacent rows showed a preference of 70–85% for the susceptible variety Schlandstedter. More detailed examinations showed that roughly equal numbers of insects settled on the two varieties but on Rastatter 99% of them flew off again within a space of 3·5 min. During this time the aphid has pierced the leaf several times and thus been able to transmit virus infections. On the other hand,

observations on lettuce have shown that aphids settle less often on brown-leaved varieties which consequently remain relatively free from virus infection.

CEREALS

3876 I radio-isotopi al servizio dell'agricoltura. (**Radioisotopes at the service of agriculture**).
Ital. agric. 1957 : **94** : No. 4 : i–iv, vi.
Among other topics briefly mentioned are the production by radiation breeding of cereal varieties resistant to rust and lodging, of differing maturity or adapted to particular conditions of rainfall and soil fertility.

3877 Ruebenbauer, T., Młodzianowska, D. & Ugarynko, A.
Wyniki doświadczeń z odmianami zbóż w latach 1950–1952. (**Results of experiments with cereal varieties in the years 1950-1952**).
Roczn. Nauk rol. : Ser. D : 1956 : **76** : 5–423.
Data are presented on the performance of numerous rye varieties (pp. 5–85), winter wheats (pp. 87–217), spring wheats (pp. 219–286), spring barleys (pp. 287–354) and oat varieties (pp. 355–423) in different regions in Poland and recommendations are made as to the most suitable varieties for cultivation in each area.

3878 Perttula, O.
Syysviljojen lajikekysymysten selvittelyä lounais-Suomessa. (**Elucidation of the question of winter cereal varieties in south-west Finland**).
Koetoiminta ja Käytäntö 1956 : **13** : 29, 32.
Comparative data on the performance of a number of winter rye and wheat varieties and lines are given based on trials in 1955. Best results for rye are given by Toivo [Hope] while Varma [Sure] is the best yielding winter wheat. Data are also given on the winter hardiness and length and strength of straw of several wheat varieties and lines.

3879 Vestergaard, E.
Abed Planteavlsstation. (**Abed Plant Breeding Station**).
Planteavl. Loll.-Falster. 1956 (1957) : 3–14.
Details are given of the results of wheat trials held in 1952–55 and oat and barley trials conducted in 1956. Five short-strawed barleys, Abed 3–143, 3–173, 3–371, 3–391 and 3–407, developed from a cross between Weihenstephan II and a short-strawed mutant line from Rigel, have given consistently high yields over three years.

3880 **Cereal news from Canada.**
Cereal News 1957 : **3** : No. 1 : 9–27.
Wheat. Promising results have been obtained in trials with GC361, a wheat line developed at the Ontario Agricultural College from crosses involving Trumbull–Hope–Hussar and Dawson's Golden Chaff. It is a soft red winter wheat giving good quality grain and possessing resistance to leaf rust, loose smut and common bunt.
Oats. Two introduced lines, CD3672 from Sweden and CD3859 from Ireland, have been used at Charlottetown in crosses with standard varieties with a view to improving resistance to lodging and to *Septoria avenae*. A number of the F_2 progeny are promising in this respect. The new variety Fundy, developed by the Experimental Farm, Fredericton, has been released (cf. Abst. 1657). A selection from the cross Ajax x Roxton, made at Macdonald College and hitherto known as MC6040, has shown promise in three-year trials, especially in Quebec, and has been released under the name of Glen. It is in the same maturity class as Shefford and has similar straw characters but gives higher yields. Its leaf-rust resistance is better than that of Shefford under field conditions and its stem-rust resistance is described as being particularly effective against race 7. Shield, produced by the Experimental Farm, Kapuskasing, Ontario, from a cross involving Ajax, Roxton and RL1276, has also been released and is characterized by early maturity and disease resistance. The Science Service Laboratory, Winnipeg, reports that 36 races and subraces of *Puccinia coronata* were identified in Canada in 1956, with races 201, 202, 209, 212, 239 and 240 together comprising 68% of the total and races 251, 263, 274, 276, 284 and 285 being identified for the first time in Canada. Race 7 was the most prominent of the races of *P. graminis* var. *avenae* identified in 1956.
Barley. The recently developed barley variety Parkland, described in *PBA*, XXVI, Abst. 2326, is being distributed in eastern Canada.
Progress is being made in the interspecific hybridization programme being carried out at Ottawa and the malting characteristics of disease-resistant segregates from *Hordeum leporinum* x *H. vulgare*[2] appear fairly promising. Swan, developed at the University of Manitoba from crosses involving Newal, Peatland and Montcalm, has been licensed by the Canadian

Department of Agriculture. It is a sister selection of UM570, described in Abst. 4020.

3881 **1956 Report of the Grain Research Laboratory, Board of Grain Commissioners for Canada, Winnipeg, Manitoba 1957** : Pp. 80.

Wheat. On the basis of three-year quality tests of hard red spring wheat, CT724 was classed as inferior to Marquis. None of the varieties in two-year tests was equal to Marquis but four of those tested for one year only were promising and classed as equal to Marquis. Of the amber durum wheats, DT210 was classed as equal to Mindum after three-year tests, DT141 and DT211 after two years and DT144, 146, 147 and 214 (Langdon) after one year. Samples of bread and macaroni wheats from a number of other countries were again compared with Canadian varieties.

Barley. Br3833, now released as Parkland, and UM584 again show promising malting quality in their third trial year and UM570 is unusually high in wort nitrogen and saccharifying activity. In two-year trials Br3902 has been promising and Br3831 has done well in its first year. Herta has been found inferior in malting quality to Hannchen while Edda is similar to Olli. Four hybrids grown in eastern Canada were studied and GB61 and Kapuskasing 4061–8 were promising.

3882 **Small grain in varietal tests conducted in Virginia 1956.**
Res. Rep. Va. agric. Exp. Sta. 1957 : No. 5 : Pp. 52. (Mimeographed).

A detailed report of trials of named and experimental varieties of wheat, oats and barley is provided.

3883 Golovcov, L. A.
(Experiments on interspecific vegetative hybridization of cereals).
Agrobiologija (Agrobiology) 1956 : No. 5 : 55–61. [Russian].

The research referred to in *PBA*, XXIII, Abst. 1023 has been continued and has given the following additional results. The first three seed generations of a graft hybrid, obtained by insertion of embryonic tissue from a branched wheat into the embryo of a hard wheat, resembled the hard wheat component but some fourth generation plants had branched ears with large grains intermediate in gluten content between the hard and branched wheats.

The embryo of a hard wheat was transplanted on to barley endosperm and the grains from the resultant plants were subjected to the same treatment for five generations without any effects being apparent. But in the sixth generation a few plants arose which differed morphologically from the hard-wheat component. The progeny of these plants gave many segregates, all of which were new botanical forms of wheat. The graft hybrid between the rye Taraščanskaja 4 and the wheat Lutescens 17, which was referred to in the previous report, has given segregates in the succeeding generations. Several productive forms of rye interesting for large grain and a high protein content were selected. Cytological analyses of these plants showed that some had the normal 14 chromosomes, others 16, 14 and 28, or 18 and 36.

3884 Chitre, R. G., Desai, D. B. & Raut, V. S.
The nutritive value of pure bred strains of cereals and pulses. I. Thiamine, riboflavine and nicotinic acid content of 107 purebred strains of cereals and pulses.
Indian J. med. Res. 1955 : **43** : 575–83.

Analyses have been carried out on 51 varieties of rice, 13 of wheat, seven of *Sorghum vulgare*, two of *Pennisetum typhoideum*, one of *Eleusine coracana*, five of *Setaria italica*, 10 of *Cajanus indicus*, four of *Phaseolus mungo*, seven of *Ph. roxburghii*, three of *Dolichos biflorus*, and two each of *Cicer arietinum* and *Lens esculenta* from several localities in India. Wide variation in vitamin content was found between strains, together with slight variation between samples of the same strain from different localities.

3885 Galinat, W. C.
Evolution leading to the formation of the cupulate fruit case in the American *Maydeae*.
Bot. Mus. Leafl. Harv. Univ. 1956 : **17** : 217–39.

The inflorescences of the American Maydeae are visualized as having evolved from spreading panicles of the type found in the Andropogoneae by means of reductions from perfect to unisexual flowers, paired to single spikelets, long to short glumes and pubescent to glabrous flowers. A simultaneous enlargement of the rachis diameter is envisaged, together with the development of a concave rachis segment with an adnate prophyll which extends laterally to join the outer glume of the enclosed spike, thus forming a cupular structure. The axillary pulvinus in the male inflorescence of maize and teosinte is regarded as a modified prophyll. A similar evolutionary series leading to the development

of a fruit case formed from a concave rachis segment is described for the Hordeeae.

3886 Fadrhons, J.
Meziodrůdové křížení samosprašných obilovin při volném opylení. (**Intervarietal hybridization of self fertilizing cereals using free pollination**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 163–72.

The results of experiments at Semčice on spring and winter wheats and barley are reported. In each case the seed parent was emasculated and left to open pollinate with one or more varieties of the same species. It was found that each ear contained 1·3 to 14·7% hybrid grains. Their weight was 32·7–62·2% of the grain weight of the maternal parent. The progenies from open pollination by different botanical varieties were morphologically distinguishable from the seed parent and continued to segregate. This necessitated continuous selection of mother plants in later generations. The principal effects of pollination of the spring wheat Ratboř by pollen of Vega + Stara Ves PK50 were improvements of the flour and especially the baking quality, as compared with the maternal parent. Among the progenies 30·6% families were superior to Ratboř in resistance to lodging, 7·6% were earlier, 63·8% had better quality of flour and 81·3% better baking property. A number of forms with good baking and flour properties and improved resistance to lodging were selected. However, in grain yield and resistance to *Puccinia* they showed no improvement over Ratboř and were more susceptible to *Erysiphe*.

3887 Mansfeld, R.
Die Bedeutung der Getreïdesystematik und der Getreidesammlungen für die Züchtung. (**The importance of cereal systematics and cereal collections for breeding**).
3. Internat. Brotkongr. Hamburg 1955 (1956) : 50–52.

The speaker in this lecture emphasized the difficulty of achieving a true phylogenetic classification, while pointing out the defects of most morphological systems of classification and the disadvantages of using ecological, physiological and other features for taxonomic purposes. The desirability of maintaining representative collections of cultivated varieties and their value both for the systematist and the breeder were enlarged upon and the need to extend the World Catalogues to other crops was urged.

3888 Misra, D. K.
Study of drought resistance in certain crop plants.
Indian J. Agron. 1956 : **1** : No. 1 : 25–39.

Four varieties of wheat and four of maize were subjected to varying periods of soil drought at different stages of growth in pot experiments in the greenhouse at the Planning Research and Action Institute, Lucknow. As indicated by survival percentages, the wheats Wichita and Pawnee were more drought resistant than NP4 and NP5 and the maize hybrids K2234 and K1639 more resistant than K1830 and K1784. Wheat was more susceptible to drought at the boot stage than at the age of 2–6 weeks; maize suffered more severe injury at the age of 6 weeks than at earlier stages. Varietal differences in susceptibility were maintained after hardening. (Cf. Abst. 4010).

3889 Powers, H. R. (Jun.) & Moseman, J. G.
Pathogenic variability within cleistothecia of *Erysiphe graminis*.
Phytopathology 1957 : **47** : 136–38.

When tested on wheat and barley differentials respectively, *E. graminis* vars. *tritici* and *hordei* showed a wide range of variation in pathogenicity among single-ascospore cultures derived from the same or different fruiting bodies. As many as three pathogenic types originated from an individual fruiting body. Fourteen pathogenic types were identified among 53 cultures of var. *hordei* and 7 among 56 cultures of var. *tritici*.

3890 **Reports of Cooperative Uniform Cereal Rust Observation Nurseries.**
US Dep. Agric., Agric. Res. Serv., Field Crops Res. Branch, Beltsville, Md. 1954 (1955) : No. 36 : Pp. 30; 1955 (1956) : No. 37 : Pp. 25; and 1956 (1957) : No. 38 : Pp. 28. (Mimeographed).

Information is given on the reactions of varieties of wheat and barley to stem and leaf rusts and of varieties of oats to stem and crown rusts in the USA. The entries comprise commercial and experimental varieties. Data on physiological races of the different rusts are also provided.

3891 Johnson, T.
The rusts of wheat and oats in Canada 1956.
Robigo, Castelar 1957 : No. 3 : 3–5; also in Spanish. (Mimeographed).

The distribution of the different races of wheat and oat rusts is briefly described. A marked decrease in race 15B of *Puccinia graminis* var.

tritici was noted, together with an increase in races 11 and 56. Changes in the proportions of the biotypes of 15B were also recorded. The most prevalent race of *P. rubigo-vera* var. *tritici* was race 15 and a decrease occurred in the prevalence of race 5 as compared with the preceding year. Seven races of oat crown rust were isolated for the first time in Canada. Five of these races can attack all the commercial varieties now grown.

WHEAT

3892 **Winter wheat variety trials 1954 to 1956.**
Tech. Bull. Edinb. Coll. Agric. 1957 : No. 21 : Pp. 12.

A report is given of trials of Als, Alpha, Cappelle Desprez, Masterpiece, N59 and Victor II with respect to yield, disease resistance and other characters in east Scotland.

3893 Maliani, C.
Frumenti duri in corso di costituzione. (**Hard wheats in the process of development**).
G. Agric. 1957 : **67** : p. 167.

After mentioning the aims of hard wheat breeding in Italy, namely the transfer of greater yielding ability, earliness and shorter, stronger straw from soft to hard wheats, the author describes briefly the development of the variety Roberto Forlani (cf. *PBA*, XXVI, Abst. 308) from Villa Glori, with $n = 21$, and Grano del miracolo [Miracle wheat], with $n = 14$. Roberto Forlani itself is fully fertile, with $n = 21$, and has been crossed with several hard wheat varieties giving fully fertile progeny. Segregation in the F_2 has yielded a range of types combining earliness, short stems, strong straw and better flour quality than those of the hard wheat parent, all of which characters are thought to be derived from Villa Glori.

3894 Huttunen, E.
Syysvehnän jalostuksen nykytavoitteista. (**Current attempts at the improvement of winter wheat**).
Koetoiminta ja Käytäntö 1956 : **13** : p. 2.

A general account of winter wheat cultivation in Finland is given, with references to the varieties Varma [Sure], Vakka [Bushel], Olympia and Antti. Indications of the directions in which improvement is necessary are included.

3895 Valle, O.
Syysviljojen viljelymme laajentamisesta. (**The expansion of our winter cereal cultivation**).
Koetoiminta ja Käytäntö 1956 : **13** : 25, 27.

A discussion is presented on the suitability of the more commonly grown Finnish varieties of winter rye and wheat to local conditions and on the need for further improvements. The new winter wheat variety Antti receives special mention.

3896 Chao, H.-C.
(**The raising of Pi-ma 1 wheat**).
Nung-yeh-hsueh Pao/Act. agric. sinica 1956 : **7** : 1–12. [Chinese].

Wheat breeding work in Shensi in recent years is described. The variety Pi-ma 1 (Ma-tse [Grasshopper] x Pi-yu [Green Jade]) is characterized by high yield, good quality, hardiness and resistance to yellow rust. Other hybrids of value on account of resistance to drought, yellow rust or *Sitodiplosis mosellana* are also mentioned.

3897 Quagliotti, F.
Secondo quadriennio di prove su cultivar di frumento nel piano bolognese. (**Second four-year trial of wheat varieties in the plain of Bologna**).
Ann. Sper. agr. 1957 : **11** : 821–57.

The results are given of trials carried out between 1951 and 1955, including 60 recently developed wheat varieties, using simple or triple lattice layouts. Tabulated data on growth period, resistance to cold, lodging and diseases and yield are included. Among the newer varieties described are Generoso [Generous] (cf. *PBA*, XXV, Abst. 932), Produttore [Yielder] (cf. *PBA*, XXVI, Abst. 2225) and Campodoro [Field of gold]. The latter variety, found in a field of Freccia [Arrow] and Mara by Michahelles, is an early, soft winter wheat, of medium height and with lax ears. During three-year trials it has given good yields and has shown good resistance to cold, lodging and disease. (Cf. *PBA*, XXIII, Abst. 1080).

3898 Lebsock, K. L. & Smith, G. S.
The inheritance of head characters in tetraploid wheat hybrids : II. Rachis bristles, awns, glume tenacity, clavate head, and seed color.
Agron. J. 1957 : **49** : 202–05.

The results of the second study in this series (cf. Abst. 2760) indicate that the two lines crossed, Ld.222 durum and a selection from Mindum durum x Vernal emmer, differed by a

single factor pair for the following three characters:—awnless *vs.* long awns, long *vs.* short rachis bristles and red *vs.* amber kernel colour. Transgressive segregation was noted for glume tenacity, with a tendency toward dominance of low over high tenacity. Head types more extreme than those of either parent were recovered in the F_2 and F_3 and it is suggested that the expression of clavate head types is affected by three pairs of clavate-producing alleles and one clavate-inhibiting pair. Clavate heads were found to be lower in mean glume tenacity than nonclavate, and those with amber kernels lower than those with red, although the association was not so close as to suggest that selection for specific combinations would be difficult. The factors responsible for the expression of awns and rachis bristles were found to be linked with a recombination value of 32·3%.

3899 Hermsen, J. G. T.
Semi-lethality in hybrid offspring of wheat.
Euphytica, Wageningen 1957 : **6** : 18–25.

Semilethality, expressed as gradual withering from the stage just before earing, occurred in crosses of (1) Koga with H11, Heine 476, Heine VII and Mendel and the reciprocals, (2) Eskischir (= Eskişehir) with Spelt line 10 and Heine VII and the reciprocals, and (3) Plantahof x Mus XII/8/222. Only the last-mentioned cross did not produce F_2 seed. Data from the Koga crosses indicated that semilethality depended upon two dominant complementary genes. The dissimilar degrees of withering in the different F_1s and the almost continuous gradation in amount of withering among the semilethal F_2 segregates of each cross are attributed to modifiers.

3900 Lysak, S. A.
(Experiments on crossing wheat with rye and *Agropyron*).
Priroda (Nature), Leningrad 1957 : No. 4 : 92–96. [Russian].

Hybrids LV1 and LV2 were obtained at Veselyĭ Podol by crossing the wheat Lesostepka 75 [Woody Steppe 75] with the winter rye Veselyĭ Podol. Self sterility of the F_1 was overcome by repeated pollination with mixed pollen of the parent species. LV1, selected in the F_2, has large grain and firm straw and shows resistance to *Puccinia* and *Erysiphe*. LV2 was selected in the F_3 and has the same economic characteristics as LV1. A description is also given of a hybrid between LV1 ♀ and *A. repens* ♂. In the case of this F_1 hybrid the sterility was overcome by repeated pollination with the pollen of LV1.

3901 Moldenhawer, K.
Morfologia pochewki korzonkowej (coleorhiza) w liniach krzyżówki ♀ *Triticum vulgare* Vill. x ♂ *Agropyrum elongatum* Host (P.B.). [**The morphology of the coleorhiza in lines from the cross *T. vulgare* Vill. ♀ x *A. elongatum* Host. (P.B.) ♂**].
Acta agrobot., Warszawa 1956 : **5** : 63–69.

Lines showing constant morphological characters were obtained from the above cross, in which only the male parent had hairs on the coleorhiza. In some of the lines a constant proportion of seedlings with hairy coleorhizas occurred in different years and different places of growth while in other lines the proportion varied with time and place. No correlation was found between hairiness of the coleorhiza and other morphological characters.

3902 Szmal, B.
Badania orientacyjne nad kilku liniami krzyżówki generatywnej ♀ *Triticum vulgare* Vill. x ♂ *Agropyrum elongatum* Host pod względem niektórych cech glutenu. (**Preliminary studies of some lines from the sexual cross *T. vulgare* Vill. ♀ x *A. elongatum* Host ♂ with regard to certain gluten characteristics**).
Acta agrobot., Warszawa 1956 : **5** : 5–17.

Lines from the above cross were markedly higher than the ♀ parent, Biała Kleszczewska [Kleszczewska White], in total nitrogen content of the grain, wet and dry weight of gluten and moisture content of the gluten. No correlation was found between the ratio of glutenin to gliadin on the one hand and gluten characteristics and baking quality on the other.

3903 **Detailed descriptions of varieties of wheat, barley and oats recommended by the National Institute of Agricultural Botany.**
Supplement 1957 : unpaginated.

Leaflets revising the lists of recommended varieties of wheat, oats and barley issued by the National Institute of Agricultural Botany, Cambridge, England, and providing descriptions of the German spring wheat Koga II, Swedish spring wheat Fylgia II and winter wheat Dominator, which are provisionally recommended, have been issued as a supplement to the handbook published in 1954 (cf. *PBA*, XXV, p. 456).
First distributed in 1955, Dominator was selected from Jubilegem x Atle by Miln & Co., Chester. In trials during 1953–56, it has

equalled Bersée and surpassed Holdfast in grain yield. It has ripened approximately two days earlier than Bersée and remained free from serious attack by *Puccinia glumarum* but appeared to be more susceptible to *Erysiphe graminis* than Bersée. It has not been infected by *Ustilago tritici*. In winter hardiness, Dominator is intermediate between Bersée and Holdfast, and in standing ability equal to the former. Its resistance to sprouting is good and its milling and baking quality high.

3904 Favero, A.
Varietà di grano in prova. (**Wheat varieties under trial**).
Sementi elette 1957 : **3** : No. 1 : 62–63.
The following wheat varieties are amongst those recently developed by the Institute of Plant Breeding and Cereal Culture at Bologna:— *IBO* 911 is medium early, resistant to cold, lodging and rust and is particularly suited to cultivation in mountainous regions. *IBO* 1892 is also resistant to lodging and rust and is similar to Funo although rather less cold resistant. It is recommended for use in central Italy. *IBO* 110 is an early variety, possessing rust and lodging resistance, suitable for regions where Libero [Free] is at present grown. *IBO* 763 is also early, with short, strong straw. For this reason it is resistant to lodging and is adapted to culture in fertile soils in the plains. *IBO* 1364 is a very early, dwarf variety similar to *IBO* 763. *IBO* 2166 is characterized by its branching ears and short straw. It is early and resistant to lodging and rust.

3905 Favero, A.
Grani duri. (**Hard wheats**).
Sementi elette 1957 : **3** : No. 3 : 68–69.
The Experiment Station for Wheat Growing in Sicily has developed three new hard wheat varieties. Duro SG3 [Hard SG3], from Timilia x Biancuccia [Greyish-white], has a short vegetative cycle and is therefore adapted to late sowing. It is moderately resistant to lodging, rust and drought. Capeiti 8 (Eiti 6 x Sen. Cappelli) is a very early variety, sparsely tillering, with short, strong straw highly resistant to lodging. It is moderately rust resistant and possesses good milling quality. Patrizio 6 [Patrician 6], from the same cross as Capeiti 8, is similar to its sister selection and is described as possessing good technological characters.

3906 Pearson, F. B.
Choosing wheat varieties.
J. Dep. Agric. S. Aust. 1957 : **60** : 333–38, 343.
The characteristics of varieties available for cultivation in South Australia are discussed. The recommended wheats described include the recently released variety Claymore [Gabo x (Dundee x Caliph)] (cf. Abst. 356).

3907 **Wheat varieties recommended for Queensland—1957 season.**
Qd. agric. J. 1957 : **83** : 53–55.
Recommended varieties are indicated. At present the two popular varieties with the highest degree of field resistance to stem rust are Spica and Lawrence.

3908 Walkden Brown, C.
Wheat varieties for 1957.
Agric. Gaz. NSW 1957 : **68** : 58–64.
Information is given on varieties recommended for commercial and trial sowings in New South Wales.

3909 Hoeser, K.
Der Sommerweizen in den bayerischen Landessortenversuchen. (**Spring wheat in the Bavarian regional variety trials**).
Bayer. landw. Jb. 1957 : **34** : 249–61.
Tests in 13 different places have shown that the average yield of spring wheats is only 4·2% below that of winter wheats. A full report is given of the trials carried out in the years 1952–56, which show that the best yields were produced by Rümkers Erli, a midearly variety with good standing capacity, resistance to brown and stem rust and baking quality. Next in order of yield were NOS–Nordgan, Lichti II and Heines Koga II.

3910 **Cereal recommendations.**
Commonw. Agric. 1957 : **27** : 16–21.
The varieties recommended include the new wheat Olympic, producing a flour superior in baking quality to any of the standard wheats in Victoria.

3911 Wienhues, F. & Giessen, J.-E.
Die Abstammung europäischer Weizensorten. (**The origin of European wheat varieties**).
Z. Pflanzenz. 1957 : **37** : 217–30.
Diagrams are given showing the pedigrees and interrelationships of the French and Belgian wheats, the spring and winter wheats of Sweden, northern Germany and southern Germany and the winter wheats of Italy. From these diagrams the main lines along which wheat breeding has developed in the respective countries can be seen and are discussed. Attention is called to the successful use of introduced varieties as

parents, as for instance French and English wheats in France, Sweden and Germany, Russian wheats in France and Germany and Japanese wheat in Italy; the success of this method is ascribed to combinations of potentialities of adaptation to local climatic conditions and of yielding ability from the respective parents and the view is expressed that much further advance should be possible if such combinations were tried out on a wider scale.

3912 RÀJHÁTHY [RAJHÁTHY], T.
Tetraploides *Triticum monococcum* L. (2*n* = 28). [**Tetraploid *T. monococcum* L. (2*n* = 28)**].
Züchter 1957 : **27** : 85–89.

Grains of *T. monococcum* var. *flavescens* were germinated in a 0·02% colchicine solution and the seedlings were later injected at the growing point with a 0·2% solution. In this way 14 tetraploid plants, together with a number of chimeras, were produced; the tetraploids have larger ears and larger grains but in most morphological features resembled the diploids. All showed reduced fertility but some plants more than others, the best having a fertility of some 10%.

3913 GIRFANOV, V. K. & RAHIMOV, È. M.
(Changing the spring wheat variety Lutescens 62 into a winter form).
Agrobiologija (Agrobiology) 1956 : No. 5 : 30–34. [Russian].

A new winter variety was obtained in Baškiria by training Lutescens 62 for the winter habit. The new form exceeds Uljjanovka and Čišmy in yield and size of grain.

3914 SOKOLOVA, S. M.
(A description of the physiological properties of winter and spring wheats).
Dokl. Vsesojuzn. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1956 : No. 12 : 15–21. [Russian].

Differences between spring and winter wheats with regard to respiration rate, peroxidase activity and synthesis of chlorophyll pigments under varied temperature and light conditions are described. Winter forms obtained by training spring wheats for the winter habit showed a similar mode of synthesis of chlorophyll to winter wheats while spring wheats derived from winter varieties were intermediate in this respect in normal daylight but behaved like spring wheats in blue light.

3915 FAJERSSON, F.
Bestockningsförmågan hos några höstvetesorter vid mindre och större plantavstånd. (**Tillering capacity in some winter wheat varieties at wide and close planting distances**).
Agri hort. genet., Landskrona 1957 : **15** : 98–103.

Of ten Swedish winter wheats grown at 8 x 12·5 cm. and 25 x 25 cm. over the period 1948-52, Eroica I and Eroica II produced most tillers at both planting distances while Skandia II showed the greatest increase in tillering in response to wider planting.

3916 POLLHAMER, E.
Pergési vizsgálatok őszi búzán. (**Studies on shattering in winter wheat**).
Növénytermelés 1956 : **5** : 217–26.

A method of determining shattering resistance, involving shaking the ripe ears in a Brabender sieve at five-minute intervals over a period of 30 minutes, is described. The foreign varieties Cheyenne, Noé and Narodnaja [Popular] and the new Hungarian strain M96 were highly resistant to shattering.

3917 EL GINDY, M. M., LAMB, C. A. & BURRELL, R. C.
Influence of variety, fertilizer treatment, and soil on the protein content and mineral composition of wheat, flour, and flour fractions.
Cereal Chem. 1957 : **34** : 185–95.

In an investigation of Pawnee, Seneca and Cornell 595, the effect of variety reached its greatest expression with respect to the protein contents of the whole wheat and gluten, ash content of the whole wheat, and composition of the ash of the whole grain and flour fraction.

3918 VILLANUEVA NOVOA, R.
Herencia de color de las aurículas del trigo. (**Inheritance of colour of auricles in wheat**).
Bol. trimestr. Exp. agropec. Progr. Coop. Exp. Agropec., Lima 1956 : **5** : No. 2 : 25–27.

In the F_2 of the cross H44–Marquis x Kenya 58 there were 219 plants with red auricles like Kenya 58 and 76 with green like the other parent. The monofactorial inheritance was confirmed by the F_3 results.

3919 VEIJOLA, T.
Eräiden Suomessa viljeltävien vehnälajikkeiden laatuvertailua. (**A comparison of the quality of a number of wheat varieties cultivated in Finland**).
Maatalous 1956 : **49** : 250–52.

A series of Finnish and introduced varieties of

winter and spring wheat are compared with respect to the characteristics of the grain and husk and the quality of the flour.

3920 Pollmer, G.
Untersuchungen zur Ertragsbildung bei Sommerweizen. (**Investigations on the constitution of yield in spring wheat**).
Z. Pflanzenz. 1957 : **37** : 231–62.

Observations made at Weihenstephan in Bavaria on Erli and Koga II and two older varieties revealed differences between them in respect of tillering, number of mature ears, yield after late sowing and reduction in spikelet number per ear in dense stands. The spikelet number was on the whole a more important yield component than ear number. An analysis of 16 varieties in tests throughout Germany showed significant variations in yield, which varied from 19 to 53 c. per ha.; however only 7·7% of this variation was ascribed to variety, the rest to environmental differences. The relative figures were 5·3% for ear number, 9·5% for yield per ear, 24% for grains per ear and 34·9% for grain weight. Tabular data showing the yields of 12 varieties in the years 1952–4 and the breakdown of the yield into the above four components are presented; they again demonstrate the differences between varieties in respect of number of grains per ear and yield of individual ears. Certain varieties, such as Nordgau, Lichti früh [Early Lichti] and Markgraf, showed a correlation of high tiller number and low grain weight with earliness; others such as Peko, Peragis II and Franken II showed the reverse correlation whereas in the majority of varieties no correlation was observed.
The best of the modern varieties show less reduction of spikelet number and yield per ear in dense stands and it is suggested that breeders should aim towards a type of spring wheat which at high seed rates produces plants with a large number of well-formed ears under a wide variety of environmental conditions.

3921 Miladinović, N.
O ozimosti i otpornosti protiv zime jare pšenice sorte thatcher. (**Overwintering and cold resistance of the spring wheat variety Thatcher**).
Arh. poljopr. Nauk 1956 : **9** : No. 23 : 3–10.

As a preliminary to transferring the resistance of Thatcher to *Puccinia* to the winter wheat Rumunska Crvenka [Rumanian Red], the former was tested for winter hardiness at Zaječar, eastern Serbia. It was found that Thatcher, sown as a winter wheat, possessed fair resistance to cold. This fact is attributed to Thatcher being derived from the winter variety Kanred.

3922 Ullrich, H. & Heber, U.
Über die Schutzwirkung der Zucker bei der Frostresistenz von Winterweizen. (**On the protective effect of sugars in the frost resistance of winter wheat**).
Planta 1957 : **48** : 724–28.

In studies of three varieties a higher sugar content was generally found in plants grown at low than at high temperatures. A positive relationship was established between sugar content and percentage of undenatured heat-stable protein occurring in homogenized plant extracts after exposure to −25° C., suggesting that sugar has a protective influence upon heat-stable proteins during freezing. There was evidence that other protein fractions are similarly protected. Sugar content was not directly related to the frost resistance of the varieties.

3923 Pesola, V. A.
Jokioisten uusien kevätvehnälajikkeiden laonkestävyydestä. (**The strength of straw in the new Jokioinen spring wheat varieties**).
Koetoiminta ja Käytäntö 1956 : **13** : 9, 12.

Data concerning strength of straw are given, drawn from trials in different localities in Finland during the years 1944–54. Timantti [Diamond] was used as the standard; Timantti II and especially Touko [Sowing] showed definite superiority to it.

3924 Nover, I.
Sechsjährige Beobachtungen über die physiologische Spezialisierung des echten Mehltaus (*Erysiphe graminis* DC.) auf Weizen und Gerste in Deutschland. [**Six year's observations on the physiological specialization of mildew (*E. graminis* DC.) on wheat and barley in Germany**].
Kühn-Archiv 1956 : **70** : 541–42.

The results reported in this dissertation show that 10 races of wheat mildew are present in Germany, race 4 being the commonest; 16 races of barley mildew were identified.
In the Gatersleben wheat collection 85% of the diploid, 12% of the tetraploid and only 1% of the hexaploid wheats were resistant to all five races tested.

3925 Hopp, H.
Untersuchungen über die Braunfleckigkeit des Weizens und ihren Erreger *Septoria nodorum* Berk. (Syn. *Macrophoma Hennebergii* Kühn). [**Investigations on glume blotch of wheat and its pathogen *S. nodorum* Berk. (syn. *M. Hennebergii* Kühn)**].
Phytopath. Z. 1957 : **29** : 395–412.

This general study of *S. nodorum* (= *Leptosphaeria nodorum*) includes data on the varietal resistance of some German varieties. The winter-hardy variety Carsten VI was especially resistant.

3926 Hall, W. E. & Foote, W. H.
Columbia, a new hard red winter wheat.
Ext. Circ. Inst. agric. Sci. St. Coll. Wash. 1957 : No. 275 : unpaginated.

Developed from Rio-Rex x Nebred, Columbia is a smut-resistant variety intended as a substitute for Rio and other Turkey varieties in areas of low rainfall in Oregon and Washington (cf. Abst. 2650).

3927 Vogel, O. A. & Morrison, K. J.
Omar, a red-chaffed white club wheat.
Ext. Circ. Inst. agric. Sci. St. Coll. Wash. 1957 : No. 276 : unpaginated.

The red-chaffed white club wheat Omar (Elgin–19 x Elmar) has been released for the Pacific North-western region in the USA mainly on account of its superiority over other club wheats in resistance to smut (cf. Abst. 1571). It is also highly resistant to common and dwarf bunt.

3928 Miczyński, K.
Wrażliwość odmian pszenicy jarej na śnieć cuchnącą (*Tilletia caries* Tul.) przy sztucznym zakażeniu. [**The susceptibility of spring wheat varieties to bunt (*T. caries* Tul.) as determined from artificial inoculation**].
Acta agrobot., Warszawa 1956 : **5** : 139–45.

In inoculation experiments involving 57 spring wheats, all varieties of *Triticum vulgare* and *T. durum* were severely infected, while the five *T. timopheevi* lines tested and two of the three *T. persicum* lines remained free from bunt. *T. persicum* gives partially or fully fertile hybrids with *T. vulgare* and *T. durum* and may therefore be useful in breeding for resistance to bunt.

3929 Ciferri, R. & Scaramuzzi, G.
Suscettibilità delle linee selette italiane di frumento alle "carie" e tassonomia delle *Tilletia* triticicole. Parte I.—Risultati delle infezioni in campo. (**The susceptibility of selected Italian varieties of wheat to bunt and the taxonomy of *Tilletia* attacking wheat. I. Results of field infection**).
Ann. Sper. agr. 1957 : **11** : 719–22.

Tabulated data are provided showing the reaction of 67 wheat varieties to artificial inoculation in the field with chlamydospores of *Tilletia* spp. from isolates from several localities in Italy.

3930 Weltzien, H. C.
Untersuchungen über den Befall von Winterweizen durch *Tilletia tritici* (Bjerk.) Winter unter besonderer Berücksichtigung der Frage der Beizmittelresistenz. [**Investigations on the incidence of *T. tritici* (Bjerk.) Winter on winter wheat with special reference to the question of resistance to seed dressings**].
Phytopath. Z. 1957 : **29** : 121–50.

Some 20 German samples of *T. tritici* were compared in respect of (1) germination of the spores in the presence of ceresan and (2) pathogenicity on wheat grown from untreated grains or from grains dressed with ceresan or tritisan. Spore germination in the presence of ceresan varied according to the sample. Differences between the samples in respect of pathogenicity on untreated grains were noted, also some differential response to the application of the seed dressings but in general the incidence of the fungus on untreated grains corresponded with that on treated grains. Little correspondence was evident between the spore germination tests and the incidence of the fungus in the field on wheat grown from dressed grains.

3931 Lelley, J.
Neue Rostinfizierungsmethode im Dienste der pathologischen Resistenzzüchtung. (**A new method of infecting with rust for the benefit of breeding for resistance to pathogens**).
Züchter 1957 : **27** : 81–85.

The method described consists in sowing the plants to be tested in a circle with diameter of 45–50 cm.; one or two plants of a susceptible variety are sown in the centre and infected artificially by hypodermic injection. The plants in the circle can be scored individually

for rust reaction or, in the case of older populations where little or no segregation occurs within families, can be scored as a whole; in the former case 10 plants per circle are sown, in the latter 30–40. A high degree of infection is attained by this method even in localities or years where conditions for rust development are unfavourable.

3932 Potočanac, I. & Kišpatić, I.
Otpornost domaćih i nekih stranih sorata pšenice prema crnoj rđi. (**The resistance of native and some foreign wheat varieties to black rust**).
Zaštita Bilja 1956 : No. 36 : 3–16.

The American spring wheats Regent, Thatcher, New Thatcher, Hope and H44, which showed resistance to *Puccinia graminis* in trials at Botinec, are being used for breeding resistant varieties adapted to Croatian conditions. Mention is made of resistant lines obtained by hybridization of the above varieties with susceptible Jugoslav wheats.

3933 Kritzinger, A.
The breeding of stem and leaf rust resistant varieties in South Africa.
Robigo, Castelar 1957 : No. 3 : p. 18; also in Spanish. (Mimeographed).

The main wheat breeding programmes since 1930 at the Elsenburg Agricultural College of the University of Stellenbosch are briefly reviewed. Several varieties obtained from the USA World Collection have shown resistance to all races of *Puccinia graminis* var. *tritici* so far isolated in South Africa.

3934 Zapata Balcazar, M.
Herencia de la "resistencia de planta adulta de trigo" a la roya amarilla *Puccinia glumarum* (Schm.) Eriks & Henn., bajo condiciones de campo. [**Inheritance of "mature-plant resistance of wheat" to yellow rust, *P. glumarum* (Schm.) Eriks. and Henn., under field conditions**].
Rev. Fac. nac. Agron., Colombia 1956 : **18** : No. 50 : 3–63.

After a rather extensive review of the literature on the nature of resistance and its inheritance, the results of the crosses Chinese 166 x Timstein and Frontana x Supremo 211 are presented, in each of which the first-named parent is resistant to *P. glumarum* and the second susceptible when tested in the field in the Sabana de Bogotá, Colombia. In both crosses the F_1 showed resistance in the field at the mature-plant stage to be dominant and monofactorial segregations were observed in the F_2 and F_3. The cross with Frontana showed the most clear-cut segregation for resistance and was the more promising from the standpoint of the agronomic qualities of the segregates.

Although the exact composition of the races of *P. glumarum* in Colombia is not known, it is assumed that they are roughly the same as those in Chile and Argentina, since many wheat varieties show the same reaction as in those countries.

3935 Wienhues-Ohlendorf, A.
Ergebnisse der Bastardierung von *Triticum timopheevi* mit Kultursorten des Weizens unter besonderer Berücksichtigung der Krankheitsresistenz. (**Results of hybridization of *T. timopheevi* with cultivated varieties of wheat with special reference to disease resistance**).
Züchter 1957 : **27** : 132–40.

The variety Timstein is not resistant to the German biotypes of mildew, or brown and yellow rust and attempts were made to cross *T. timopheevi* with local varieties of *T. aestivum*. The set was higher when *T. timopheevi* served as seed parent but the grains were better formed in the reciprocal cross. No morphological differences were observed between the hybrids from reciprocal crosses. In a hybrid of *T. timopheevi* x *T. aestivum* 'Peko' the mean bivalent number at meiosis in the pollen mother cells was 10·43, the chiasma frequency being 14·5.

The mildew resistance of the F_1 hybrids was not complete and varied with the cultivated parent; the same applied to resistance to yellow rust. The F_1 plants were grown together with winter wheat and the F_2 produced contained a majority of plants with chromosome numbers approaching $2n = 42$; none however had 21 bivalents and multivalents were frequent; the fertility was still low and only 1·7% of the plants set more than 100 grains per ear. Some 90% of the plants were resistant to mildew, only 33% resistant to brown rust; resistance to yellow rust was observed in 40–50% of these plants and of the back crosses to Heine VII and Kloka, but was lower in back crosses to susceptible varieties such as Derenburger Silber [Derenburg Silver] or Rimpaus Bastard [Rimpau's Hybrid]. The most disease-resistant plants were selected to form an F_3, which varied in chromosome number from $2n = 38$ to $2n = 45$. Neither resistance nor fertility showed a correlation with chromosome number but fertility in the F_3 and F_4 was correlated with that of the mother plant. In 30 F_3 families from resistant F_2 plants, 6

bred true for mildew resistance; all F_3 families contained over 50% of plants resistant to yellow rust but less than 50% resistant to brown rust. One F_4 plant with 42 chromosomes, which formed 21 bivalents in crosses with *T. aestivum*, was found.

By repeated selection in the later generations of some crosses it was possible to produce lines of winter wheat resembling Carsten V and of spring wheat resembling Carsten 143, both resistant to brown rust; neither is however quite equal to the Carsten parent in agricultural qualities and it is concluded that the genes for brown rust resistance may be scattered on different chromosomes of the β genome of *T. timopheevi* and hence difficult to recombine. For yellow-rust resistance a smaller number of dominant genes seems to operate and for mildew two main dominant genes, one present in *T. timopheevi* and one in *T. aestivum*, either alone being capable of producing resistance.

3936 Santiago, J. C.
Attempting to induce mutations artificially on the wheat stem rust fungus.
Robigo, Castelar 1957 : No. 3 : 15–16; also in Spanish. (Mimeographed).

Tests carried out at St. Paul, Minn. indicate that the rate of mutation of *Puccinia graminis* var. *tritici* is low compared with that of other fungal pathogens. No mutants were produced by colchicine, ultraviolet light or high temperatures.

3937 Jenkins, B. C.
Radiation induced stem rust resistant mutants in durum wheat.
Robigo, Castelar 1957 : No. 3 : 16–17; also in Spanish. (Mimeographed).

X irradiation of seeds of Stewart wheat at the University of Manitoba resulted in the production of several lines showing field resistance to *Puccinia graminis* var. *tritici*. All the mutant lines were earlier than Stewart and had shorter, stronger straw and white chaff. No rust-resistant mutants were obtained from similar treatment of Nugget.

3938 Hoeser, K.
Investigations on physiological specialization of *Puccinia graminis tritici* in Germany and Austria.
Robigo, Castelar 1957 : No. 3 : 8–9; also in German and Spanish. (Mimeographed).

During the period 1952–56, 33 races of *P. graminis* var. *tritici* were identified among isolates from southern Germany, Austria and Niedersachsen.

3939 Prasada, R. & Sreekantiah, K. R.
Identification of biotypes within physiologic races of wheat stem rust.
Indian Phytopath. 1956 : 9 : 209–11.

A new biotype of race 21 of *Puccinia graminis* var. *tritici* has been identified, in isolates from several localities in India, by its more virulent attack on Benvenuto, CVIII–23–2419 and NCV 2419 III 1931–25.

3940 Cenoz, H. P. & Vallega, J.
Physiological races of *Puccinia rubigo-vera tritici* in the Argentine Republic in the year 1956.
Robigo, Castelar 1957 : No. 3 : 9–11; also in Spanish. (Mimeographed).

During 1956 five races of *P. rubigo-vera* var. *tritici* were identified in Argentina. The reaction of 16 wheat varieties to these races is tabulated.

3941 Nyquist, W. E.
Inheritance of resistance to leaf rust in hybrids involving a common wheat strain derived from *Triticum timopheevi*.
Agron. J. 1957 : 49 : 240–43.

From data on crosses of CI12633 [*T. timopheevi* x 2666A2–2–15–6–3 (Illinois x Chinese Spring)] with Federation, White Federation and Ramona, it was concluded that the first-mentioned wheat was homozygous for two dominant complementary genes, Lr_x and Lr_y, for resistance to race 11 of leaf rust, the genotype of Federation and White Federation being $Lr_xLr_xlr_ylr_y$ or $lr_xlr_xLr_ylr_y$ and that of Ramona $lr_xlr_xlr_ylr_y$. No susceptible segregates were obtained from Chinese Spring x CI12633. Susceptible individuals appeared however in the F_2 and F_3 of 2666A2–2–15–6–3 x CI12633. CI12633 could not therefore have derived one or both of the genes Lr_x and Lr_y from Chinese Spring via the present type of 2666A2–2–15–6–3. Evidence is given showing that the last-mentioned wheat did in fact originally consist of two or more types.

3942 Sears, E. R., Loegering, W. Q. & Rodenhiser, H. A.
Identification of chromosomes carrying genes for stem rust resistance in four varieties of wheat.
Agron. J. 1957 : 49 : 208–12.

By the use of monosomic lines, at the Missouri Agricultural Experiment Station, each chromosome from Hope, Thatcher, Red Egyptian and Timstein wheats was substituted separately for the corresponding chromosome in Chinese Spring and the resulting substitution lines were tested for their reaction to up to 26 cultures of *Puccinia graminis* var. *tritici*. Genes for seedling resistance to one or more of these cultures were

found on the following chromosomes:—VIII and XVII from Hope; III, XIII and XIX from Thatcher; VI, XIII and XX from Red Egyptian; X from Timstein and XI from Chinese. Evidence was obtained for the existence on various other chromosomes of modifiers of resistance to certain rust races.

3943 Nyquist, W. E.
Monosomic analysis of stem rust resistance of a common wheat strain derived from *Triticum timopheevi*.
Agron. J. 1957 : **49** : 222–23.

Crosses were made between all the possible monosomics of Chinese Spring wheat, used as the female parents, and CI12633 (*T. timopheevi* x Illinois 1-Chinese), which is resistant to both stem and leaf rust, and the F_2 and F_3 progeny tested for stem rust reaction in the field at Davis, California. All the possible monosomic crosses except that involving chromosome XIII behaved normally, giving in the F_2 a satisfactory fit to the calculated ratio of 5·43 resistant to 1 susceptible. From the results obtained with the monosomic involving chromosome XIII it is concluded that the duplicate dominant genes for stem-rust resistance in CI12633 are located on this chromosome.

3944 Pilgrim, A. J. & Futrell, M. C.
The ascorbic acid content at different stages of growth of stem rust susceptible and resistant wheat grown under different conditions.
Phytopathology 1957 : **47** : 193–96.

Data are provided on the ascorbic acid content, at seven different stages of growth, of several wheat varieties tested at the Texas Agricultural Experiment Station. No consistent correlation was found between ascorbic acid concentration and either resistance or susceptibility to *Puccinia graminis* var. *tritici*. No consistent differences were found between tetraploid and hexaploid wheats in respect of the change in ascorbic acid content during growth.

3945 Hassebrauk, K. & Kaul, R.
Vergleichende chemische Untersuchungen des Atmungsstoffwechsels von Weizenkeimpflanzen unterschiedlicher Braunrostanfälligkeit. (**Comparative chemical investigations of the respiratory metabolism of wheat seedlings differing in susceptibility to brown rust**).
Phytopath. Z. 1957 : **29** : 305–26.

The highly susceptible variety Michigan Amber showed a lower activity of cytochrome oxidase and ascorbic oxidase, a lower content of polyphenols and ascorbic acid, a higher sugar content and a lower general metabolic activity than *Triticum monococcum* var. *hornemanni*, which is resistant to *Puccinia triticina*. Chinese 166, which is resistant to certain races but highly susceptible to others, differed from Michigan Amber in content of sugars and acids.

3946 Villanueva Novoa, R. & Llosa Baluarte, C.
Trigos selectos para la Costa Central del Perú. La variedad Super Helvia. (**Selected wheats for the central coastal area of Peru. The variety Super Helvia**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 353 : 1–5. (Mimeographed).

The new variety Super Helvia is described as a red, awned wheat resistant to mildew and to *Puccinia triticina*, *P. graminis* and *P. glumarum*. In average yield over the three years 1953–56 it exceeded Helvia (cf. Abst. 2832) in yield and it is distinctly superior to that variety in baking quality.

3947 Sharma, W. S.
Wheat rust and bunt epidemic in Iraq during 1955-56 season.
Robigo, Castelar 1957 : No. 3 : 5–6; also in Spanish. (Mimeographed).

The following varieties showed resistance to *Puccinia glumarum* and *Tilletia* spp.: 7963 and Hindi Tosson from Iran, and Psathas x Mentana, Charter and Insignia 49 from Cyprus.

3948 Šulyndin, A. F. & Manzjuk, V. T.
(**The susceptibility of hard wheat hybrids to frit fly**).
Agrobiologija (Agrobiology) 1956 : No. 5 : 22–29. [Russian].

At Harjkov, progenies of Harjkov 46 x Dlinnokolosaja 120 [Long-eared 120] and other hard wheat hybrids were raised under irrigation and under rain-fed conditions and the amount of damage caused by *Oscinella frit* to the F_2, F_3 and F_4, which had been trained in the two kinds of environment, was studied. Evidence shows that the incidence of damage to plants and the extent of damage were reduced among material that had been raised on irrigated land in the preceding generations.

3949 McNeal, F. H., Lebsock, K. L., Luginbill, P. & Noble, W. B.
Segregation for stem solidness in crosses of Rescue and four Portuguese wheats.
Agron. J. 1957 : **49** : 246–50.

The Portuguese wheats PI56219–9, PI56229–2,

PI56225–8 and PI56219–12 possess the same major gene or genes for stem solidity as Rescue. The first three differ however from Rescue in minor genes for this character. Although similar to Rescue in stem solidity as determined visually, the Portuguese varieties were more susceptible to sawfly cutting. Their value in breeding therefore appears to be confined to the possibility of using them as sources of minor genes enhancing resistance.

BUCKWHEAT

3950 Mansurova, V. V.
(Comparative caryology of two buckwheat species: *Fagopyrum esculentum* and *F. emarginatum*).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **61** : 119–22. [Russian].

Differences in the morphology of some of the above species and inversions in chromosomes V and VIII are noted. It is thought that translocation involving chromosomes V and VI may be responsible for an additional satellite in *F. emarginatum*.

OATS

3951 Lesik, F. L.
(Experimental synthesis of amphidiploids in oats).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **60** : 299–300. [Russian].

Descriptions are given of colchicine-induced amphidiploids of *Avena sativa* x *A. abyssinica* which have 70 chromosomes, are 100% fertile and combine to an unusual extent the morphological and physiological characteristics of the parent forms. The high degree of fertility is attributed to normal meiosis.
Mention is made of other amphidiploids that have been obtained: *A. byzantina* x *A. brevis* with 56 chromosomes, and *A. sativa* x *A. byzantina* with 84 chromosomes.

3952 **Oat variety trials 1954-56.**
Scot. Agric. 1957 : **37** : p. 43.

The results of trials of Ayr Everest [Ayr Commando x (R30 x Star)], the Swedish variety Lightning (Eagle x Silver II) and Aa.732 (Abundance x Early Miller) in Scotland are summarized. None of these varieties rivalled Sun II and Blenda as a grain producer.

3953 **Low-ground oat variety trials, 1954 to 1956.**
Tech. Bull. Edinb. Coll. Agric. 1957 : No. 20 : Pp. 12.

A report on high-ground oat variety trials, 1954 to 1956.
Ibid. 1957 : No. 23 : Pp. 12.

The results of trials of Scottish and continental varieties for yield and other characters in east Scotland are summarized.

3954 Nedeševa, G. N.
(Obtaining *Avena fatua* experimentally under the conditions of Moscow province).
Agrobiologija (Agrobiology) 1956 : No. 6 : 63–66. [Russian].

Experiments at Gorki Leninskie on conversion of the oat variety Dippe into *A. fatua* are reported. The evidence suggests that conversion occurred mainly among plants raised from small seed which had been subjected to low temperatures before sowing or in the progenies from grains with coarse awns.

3955 Murphy, H. C., Frey, K. J., Browning, J. A. & Atkins, R. E.
About those new oats Burnett and Newton.
Iowa Fm. Sci. 1957 : **11** : 541–42.

Additional information is given on Burnett (cf. Abst. 1661) and Newton (cf. *PBA*, XXVI, Abst. 3213). Developed at the Iowa Agricultural Experiment Station, Burnett [Victoria x (Hajira x Banner) x Colo] is the first variety resistant to both races 7 and 8 of stem rust to be released in Iowa. Newton, also released in this state, has Nemaha, Clinton, Boone and Cartia as its parents. In disease resistance it closely resembles Mo.O–205, being resistant to races 7 and 7A of stem rust, smut, Victoria blight and physiological leaf spot.

3956 **Ransom oats released.**
What's New Crops Soils 1957 : **9** : No. 7 : p. 31.

A new yellow oat variety, Ransom, resistant to all races of *Puccinia graminis* var. *avenae*, has been released by the North Dakota Agricultural Experiment Station. Possessing also moderate resistance to *P. coronata* and *Ustilago* spp., it has fairly strong straw but is moderately susceptible to *Septoria* black stem. It is not high yielding but is recommended for areas where stem rust is prevalent and where an early-maturing variety is needed.

3957 Ryan, F. E. & Bridgman, F.
Kent oats.
J. Agric. W. Aust. 1957 : **6** : 225–27.
Bred at the Wongan Hills Research Station, Kent has been released as an oat for early grazing in the south-west of Western Australia.

3958 Coffman, F. A.
Dubois winter oat unsuitable for spring sowing.
Agron. J. 1957 : **49** : 277–78.
The unsuitability of Dubois (cf. *PBA*, XXIII, Abst. 1902) for spring sowing is attributed to a recombination of genes derived from the Algerian-type ancestors of both its parents.

3959 Wiggans, S. C. & Frey, K. J.
Tillering studies in oats. II. Effect of photoperiod and date of planting.
Agron. J. 1957 : **49** : 215–17.
Data are provided on the number of tillers per plant of eight oat varieties at three different rates of planting at Ames, Iowa.

3960 Brown, C. M.
Scissor emasculation of oats.
Agron. J. 1957 : **49** : p. 278.
In 1951, clipping of the florets before the anthers dehisced showed promise as a method of emasculation in experiments on Rodney at the University of Wisconsin, although seed sets were lower than those generally obtained by the customary technique. In further applications of the method self pollination was detected. In view of the results obtained by Wells and Caffey for wheat and barley (cf. Abst. 1550), it is however suggested that the method should receive further investigation by oat breeders.

3961 Coffman, F. A.
Winter oats extended northward by breeding and testing.
Agron. J. 1957 : **49** : 187–89.
The average survival of 70 oat varieties and hybrids in the uniform winter hardiness nurseries of the USDA during the years 1951–56 is tabulated and expressed as a percentage of Winter Turf. Progress made in breeding for winter hardiness is reflected in the increasing number of selections showing better survival than the control variety. Crosses between winter and spring oats have produced strains hardier than their winter parents, the most promising of these being Dubois (Clinton x Forkedeer) which is hardier than Forkedeer and possesses many of the desirable characters of Clinton (cf. *PBA*, XXIII, Abst. 1902).

3962 Rosen, H. R.
Epidemics of powdery mildews in Arkansas in 1956 with special reference to powdery mildew on winter oats.
Plant Dis. Reptr. 1957 : **41** : 330–36.
Tabulated data are provided of the reaction of 140 oat varieties and breeding lines to *Erysiphe graminis* var. *avenae*. Victorgrain 48–93, Red Rustproof strains and several breeding lines showed a high degree of resistance.

3963 **Performance of the new smut and rust resistant hulless oat Sask. 2238 originated by the Field Husbandry Dept. of the University of Saskatchewan.**
Circ. Field Husb. Saskatch. undated : No. 568 : Pp. 3. (Mimeographed).
The differences in yield between the hulless oats Torch (Sask. 2238), Sask. 4516 [Nakota x (Victoria x Richland) x (Markton x Victory)] and Brighton were not large but the first-mentioned variety (cf. *PBA*, XXV, Abst. 2886) had the advantage of stem-rust resistance.

3964 Hooker, A. L.
Septoria reactions of oat varieties and selections in 1956.
Plant Dis. Reptr. 1957 : **41** : 385–88.
Data are provided on the reaction of 257 oat varieties and selections to *Septoria avenae*, determined at Madison, Wis. Resistance was found in selections from crosses involving Clinton, Vicland, Victoria x Richland and Hawkeye x Victoria. In two-year tests Clintafe, Clintland, Clinton, Clinton 59, Gopher and Vicland showed the least infection. (Cf. *PBA*, XXVI, Abst. 2264).

3965 Ivanoff, S. S.
The new Mid-South oat arrives.
Sth. Seedsman 1957 : **20** : No. 5 : p. 22, 43–45.
The chief advantage of Mid-South is resistance to Victoria blight. The variety was developed at the Mississippi Agricultural Experiment Station from a resistant mutant which arose spontaneously in Victorgrain 48–93.

3966 Herrmann, P.
Wirkung von Wuchsstoffmitteln auf verschiedene Hafersorten. (**The effect of growth substances on different oat varieties**).
Bayer. landw. Jb. 1957 : **34** : 94–110.
Observations on six varieties after treatment with 2,4-D and MCPA preparations showed

Carsten VII to be the variety most susceptible to damage when the preparations were applied at the tillering stage, the least susceptible being Firlbecks Regent and NOS weiss [White NOS]. The varietal differences in grain yield were not statistically significant.

RYE

3967 Varis, E.
Ruislajikkeistamme menneenä kesänä. (**Our rye varieties last summer**).
Koetoiminta ja käytäntö 1956 : **13** : p. 2.
Comparative data are given from experiments at Anttila, Finland, on the yield of grain and straw and the winter hardiness for several Finnish and foreign rye varieties. The latter are lower yielding than the Finnish varieties and Swedish tetraploid rye was completely exterminated during the winter.

3968 Pessi, Y.
Kokemuksia syysrukiin viljelystä Pelsonsuolla. (**Observations on winter rye cultivation on the Pelso bog**).
Koetoiminta ja Käytäntö 1956 : **13** : p. 36.
Experiments conducted from 1952–54 in Finland are described and comparative data are given for the yield and winter hardiness of several varieties of winter rye, the most successful being Toivo [Hope] and Engi [First].

3969 Chapman, W. H., Morey, D. D., Wallace, A. T. & Luke, H. H.
Gator rye.
Circ. Fla. agric. Exp. Sta. 1956 : No. S–94 : Pp. 8.
The mother plant from which Gator was developed was a selection of a South-American introduction. The variety probably has a better combination of resistance to leaf rust and other diseases than any other grown in Florida. It gives high yields of grain or forage but is not suitable as a dual-purpose rye.

3970 Laube, H.-A.
Untersuchungen zur Entwicklungsphysiologie am Petkuser Normalstroh-Roggen (2*n*) und Petkuser Tetraroggen (4*n*). [**Investigations on developmental physiology in Petkus normal-strawed rye (2*n*) and Petkus tetraploid rye (4*n*)**].
Forschung und Beratung 1956 : No. 5 : 33–36.
In comparison with the diploid form the tetraploid showed less tillering, fewer flowering culms, shorter and stronger straw, longer growth period, greater self fertility and less tendency to germinate on reaching maturity. The effects of various light and cold treatments upon the above characters in both forms are described.

3971 Surikov, I. M.
(**The composition of a rye population with regard to self fertility of the plants comprising it**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **110** : 680–83. [Russian].
Ear analyses of varieties such as Vjatka at Leningrad showed that the ratio of self-sterile : self-fertile plants was 2 : 1. It is suggested that self sterility is determined by a single gene pair, *Aa* plants being self sterile, *aa* plants self fertile and *AA* plants lethal.

3972 Szőke, S., Ibrányi, K. & Papp, Zs.
A magyar rozsfajták szem- és lisztminőségének vizsgálata. (**A study of the grain and flour quality of Hungarian rye varieties**).
Növénytermelés 1956 : **5** : 241–54.
Data are given on the hectolitre weight, 1000-grain weight, protein content of the grain and the protein content, amylase activity and water absorption of the flour of five varieties grown at 13 stations in Hungary. Quality of flour was influenced as much by locality as by variety.

MAIZE

3973 Matusiewicz, E.
Fotoperiodyczna reakcja niektórych odmian kukurydzy uprawianych w Polsce. (**Photoperiodic reaction of certain maize varieties grown in Poland**).
Roczn. Nauk rol. : Ser. A : 1956 : **74** : 45–54.
Eight flint, 15 dent and one popcorn variety all flowered earlier and produced more ears and grain under 11-hour photoperiods than under natural day length, later varieties showing a more marked photoperiodic response than early.

Second Annual Report of the West African Maize Research Unit 1954 : Pp. 51.

3974 *Stanton, W. R. & Cammack, R. H.*
Greenhouse studies on resistance to Puccinia polysora. (*pp. 12–20*).
The seedling reactions to *P. polysora* of 164 new acquisitions at the above research unit, Ibadan, Nigeria, and the seedling and adult reactions of 23 lines are tabulated. Selections from East Africa appear to be more susceptible when grown in West Africa but some lines from

Turrialba, Costa Rica, appear highly resistant. The results are given of tests of linkage between marker genes and rust resistance. No linkage was found but the marker stocks were not well adapted to West African conditions.

3975 *Cammack, R. H. The incidence of fungal diseases on established and newly introduced breeding lines.* (*pp. 22–23*).

With the exception of Mexico 13 all Mexican lines have increased in susceptibility to *Puccinia polysora* and must now be classed as tolerant although retaining their high yielding qualities. The Italian and Florida lines vary in their susceptibility to rust while all EAAFRO varieties show a high level of resistance to rust and *Helminthosporium turcicum*. One variety Acq.813 EAAFRO 53197, derived from EAAFRO 49, was apparently immune to blight. Two varieties from Florida, Acq.840 Agroceres sementes x Mayorbela–8 and Acq.842 Agroceres sementes x Mayorbela–10 showed grade 1 rust resistance and were also resistant to blight.

3976 *Stanton, W. R. Progress report of a maize survey of West Africa.* (*pp. 31–41*).

A study of the distribution of maize types in West Africa has been initiated. The results obtained so far are tabulated in Appendix II and the intensity of maize growing and the distribution of distinct types are shown on a map of the region. The different types are described.

Jenkins, M. T.
Report of the Twelfth Northeastern Corn Improvement Conference held at New York City March 1 & 2, 1957 : Pp. 28. (Mimeographed)

3977a *Dimmock, F. Behavior of male sterile single crosses in different locations.* (*pp. 2–3*).

Tabulated data are provided on the percentage of anther extrusion in 18 sterile single crosses of maize grown at three localities in Canada. Where pollen was shed the results of selfing indicated variation from complete sterility to complete fertility of pollen.

3977b *Stinson, H. T.* (*Jun.*). *Pollen sterility and restoration.* (*pp. 3–4*).

Differences due to environmental factors have been found in respect of the proportion of fertile maize plants in F_2 progenies of several restored single crosses. In addition the restorers showed different restoring abilities when used on the same sterile inbred and the three sterile inbreds used responded differently to the same restorer line. Evidence from back-cross studies is presented to show that at least two complementary dominant genes are involved in the expression of fertility restoration.

3978 *Buchert, J. G. Sweet corn restorers.* (*pp. 5–6*).

Details are given of five poor fertility-restorers and four which in some crosses have given 100% fertile plants at the Connecticut Agricultural Experiment Station.

3979 *Jones, D. F., Huber, L. L. & Rothgeb, R. G. Report of the committee on the registration of NE hybrids.* (*pp. 12–13*).

Descriptions of three recently developed maize hybrids are included in this report. NE310, (Oh51A–T x B8) x NY16, formerly Cornell X–3, was produced by the New York Experiment Station. It is a tall, early yellow hybrid adapted to short season areas. NE420, (Pa11 x Pa54) x (Q83Y x NY3), produced by the Massachussets Experiment Station, is also a yellow-grained early line, similar to Pa444 in appearance and adaptation. NE 912, formerly Eastern States E12, (C103 x CI 7) x (Oh07 x CI 21E), is a full season, yellow hybrid possessing good resistance to *Helminthosporium turcicum* and *H. maydis*.

3980 Penny, L. H. & Dicke, F. F.
A single gene-pair controlling segregation for European corn borer resistance.
Agron. J. 1957 : **49** : 193–96.

Further to the studies reported in *PBA*, XXVI, Abst. 3299, carried out at the Iowa Agricultural Experiment Station, the F_2 and back-cross progenies from the crosses M14 x gl_7v_{17} and WF9 x gl_7v_{17} were graded for leaf feeding by borers. WF9 and M14 are both susceptible, gl_7 (glossy) v_{17} (virescent) is resistant. In both crosses resistance appeared to be controlled by a single dominant gene which was linked to the gl_7 and v_{17} genes.

3981 Schober, K.
Hybridmais für Körner- und Silozwecke.
(Hybrid maize for grain and ensilage).
Landwirtschaft 1957 : No. 7 : p. 4.

The hybrid Wisconsin 355A has exceeded the local variety Weisser Marchfelder Körnermais [White Marchfeld grain maize] by 20% in grain yield in Lower Austria and directions are given for its cultivation. Other hybrids are recommended for ensilage.

3982 Schmidt, J.
Meziodrůdové hybridy kukuřice. **(Intervarietal hybrids of maize).**
Za vysokou úrodu 1957 : **5** : 159–61.
Out of several intervarietal hybrids investigated in the state varietal tests in Czechoslovakia, the following have been approved for regional standardization: Czech white dent x Slovak Yellow, Valtice x Hondonin yellow dent and Kočovce x Czech white dent. The degrees of heterosis expressed as a percentage of the yield of the two parents were 9·3 and 12%, 17·7 and 12·1%, and 12·2 and 13%, respectively. The morphological and physiological characteristics of the hybrids are outlined, also their regional adaptation.

3983 Volanti, U.
Il costo dei mais ibridi. **(The cost of hybrid maize).**
Agric. bresciano 1957 : **5** : No. 17 : p. 2.
An account of the principles of producing hybrids is given to explain its relatively high price; the only way to avoid this, it is suggested, is for a group of growers to produce hybrids on a cooperative basis.

3984 Milhos híbridos. Campanha de 1956. **(Hybrid maize. 1956 season).**
Estud. Inform. téc. Direcç. ger. Serv. agríc., Lisboa 1957 : No. 42 : Pp. 12.
The clear superiority of the hybrids over the local Portuguese varieties was again demonstrated (cf. *PBA*, XXVI, Abst. 3256).

3985 Glušenko [Gluščenko], I. E.
(Hybrid maize in the Nonchernozem Zone).
An. Romîno-Soviet. : Ser. Agric. : 1955 : **9** : No. 6 : 54–62.
A Rumanian version is given of the article summarized in *PBA*, XXVI, Abst. 378.

3986 Kožuhov, I. V., Emeljjanov, I. E., Lisunov, I. K., Galeev, G. S. & Kalinin, M. S.
(The hybrid VIR25).
Kukuruza (Maize) 1957 : No. 1 : p. 59. [Russian].
The hybrid VIR25 [Institute of Plant Industry 25] is a double-cross hybrid from Iskra [Spark] x Ideal, the former being a hybrid of line 26 x line 27, the latter a hybrid of line 28 x line 29, both parents having white dent grain. In the Ukraine, Kabarda and Moldavia VIR25 has yielded up to 75 c. of dry grain per ha.

3987 **(A conference dedicated to questions of production of hybrid maize seed).**
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1957 : No. 4 : 43–44. [Russian].
A report on a conference, held on 31 January to 3 February 1957 at Odessa, is presented. Among the speakers were delegates from Albania, Bulgaria, China, Czechoslovakia, the German Democratic Republic, Hungary, Yugoslavia, Poland and Rumania.

3988 Bonev, E.
(Hybrid maize seed suitable for cultivation).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1957 : No. 2 : 14–15. [Bulgarian].
In recent Bulgarian trials, intervarietal hybrids have outyielded the best local varieties, though in some districts the margin was narrow because of the high yield of the local material. Productive hybrids suitable for cultivation in each district are listed.

3989 Mošnjaga [Mosneagă], V.
(Breeding and production of hybrid seed in the Rumanian People's Republic).
Kukuruza (Maize) 1957 : No. 1 : 52–55. [Russian].
The work referred to in *PBA*, XXVI, Abst. 2295 is described for the benefit of Russian readers.

3990 **Hybrid maize.**
Indian Fmg. 1957 : **6** : No. 12 : p. 24.
A high-yielding flint hybrid, developed from local flint varieties and designated Punjab Hybrid–1, has given good results in farm trials and is ready for release in the Punjab. Punjab Hybrid–2 is also promising but has not yet undergone farm trials.

3991 Negi, L. S. & Bahans, K. S.
New hybrid maize for Punjab farmers.
Indian Fmg. 1957 : No. 1 : 32–33.
The production of the first flint hybrid in the Punjab is described. Named Punjab Hybrid 1 it was developed from SC43 (Pb68–66 x Pb72–103) x SC397 (Kash2–597 x NW12–580) and is vigorous, lodging and borer resistant and outyields local lines by up to 49%.

3992 Leng, E. R. & Finley, D. E.
1956 Illinois corn tests.
Bull. Ill. agric. Exp. Sta. 1957 : No. 605 : Pp. 30.
The results of trials of 352 hybrids, most of which were commercial, are presented.

3993 Jugenheimer, R. W. & Williams, K. E.
Experimental corn hybrids tested in 1956.
Bull. Ill. agric. Exp. Sta. 1957 : No. 606 : Pp. 29.

Information is given on the yield, maturation period, resistance to lodging and other agronomic characters of many experimental double, three-way, single and top crosses.

3994 Clapp, A. L. & Findley, W. R.
Kansas corn tests, 1956.
Bull. Kans. agric. Exp. Sta. 1957 : No. 388 : Pp. 40.

A tabulated summary of trials of commercial and experimental hybrids of maize in different districts of Kansas is provided.

3995 Rosbaco, U. F.
Rendimiento de las F_2 de híbridos comerciales de maíz. (**Yield of the F_2 of commercial maize hybrids**).
Rev. argent. Agron. 1956 : **23** : 180–84.

Data presented show that a loss of from 27 to 42% in grain yield occurs in the second generation from double-cross hybrids.

3996 Ballesteros, O. Q., Santos, I. S. & Aquilizan, F. A.
Reduction in grain yield from the F_1 to the F_2 of parental single-crosses and double-cross hybrids.
Philipp. Agric. 1957 : **40** : 443–52.

Maize hybrids tested at the College of Agriculture, Philippines, consisted of combinations of inbreds derived from College Yellow and Cuban Yellow. F_2 grain yields of parental single crosses between related inbreds were 0·8–22·8% below those of the F_1 generation. F_2 reductions in grain yield of the double crosses, which were composed of unrelated single crosses, ranged from 1·4 to 37·5%. In general, the double hybrids giving the highest yields in the F_1 showed the greatest reduction in F_2 yield. Attention is drawn to the bearing of this observation upon the production of synthetics.

3997 **Dwarf corn hybrids.**
Seed World 1957 : **80** : No. 8 : 8, 10.

This popular article describes the development of lodging-resistant dwarf maize hybrids at the College of Agriculture, Urbana, Ill., by incorporating the recessive gene brachytic 2 into standard inbred lines. Tests so far indicate that dwarf double-cross hybrids yield less than the normal hybrids but that harvesting losses are reduced.

3998 Fradkin, C.-M. W. & Brink, R. A.
Crossing over in maize in the presence of the transposable factors activator and modulator.
Genetics 1956 : **41** : 901–06.

The frequency of crossing over in the region *sh–bz–wx* of chromosome 9 was not affected by activator (*Ac*), which is situated at locus *bz* and causes instability of this locus. Modulator (cf. Abst. 1725), which when present with P^{rr} at locus *P* in chromosome 1, is responsible for variegated pericarp, also had no influence upon crossing over in the above-mentioned region with or without *Ac*.

3999 Sutô, T. & Yoshida, Y.
Characteristics of the oriental maize.
Land and crops of Nepal Himalaya. Scientific results of the Japanese expeditions to Nepal Himalaya 1952–1953 : **2** : 374–529.

A detailed comparison has been carried out, based on a total of 104 morphological and cytological characters, of 91 Oriental maize races, 43 from central Nepal, 20 from north China and 28 from Japan. Five major types which are described in detail were identified, namely North American and European among the Japanese strains, Caribbean among all three groups of strains, Persian among the Nepalese strains and Aegean, comprising most of the strains from China and Nepal. The origin of these five groups is discussed.

4000 Hocquette, M. & Colin, C.
Les noyaux interphasiques et quiescents du maïs. (**Resting interphase nuclei in maize**).
CR Acad. Sci. Paris 1957 : **244** : 2835–38.

In the sweet corn Golden Bantam and three starchy maizes, the number of chromocentres and the distinctness of the reticulum in interphase cells were greatest in the root meristem and decreased progressively in the root cap and the differentiating cells above the meristem. Differences among the four varieties in the appearance of the nucleus were consistent, Golden Bantam having the greatest number of chromocentres in each cellular region studied. Study of the content of soluble carbohydrates in the grain revealed the same relative order between the four maizes, the highest content being found in Golden Bantam. It is suggested

that the characteristics of interphase nuclei are related to carbohydrate metabolism.

4001 Wellwood, A. A. & Randolph, L. F.
Inheritance of differences in pachytene chromosome configuration in maize.
Amer. J. Bot. 1957 : **44** : 129–35.

Wellwood, A. A.
Inheritance of differences in pachytene chromosome configurations in maize.
Diss. Abstr. 1956 : **16** : Publ. No. 19,160 : 2006–07.

Inbreds Oh40B and 38–11 were characterized by a clumped type of pachytene configuration whereas inbreds CC5 and L289wx showed a well-spread type. Two other stocks were classified as intermediate in type of pachytene configuration. Data from crosses of Oh40B with CC5 and L289wx and from back crosses indicated that two or more quantitative genes determined the clumped *vs.* well-spread condition.

4002 Hansen, A.
The expression of the gene dwarf-1 during the development of the seedling shoot in maize.
Amer. J. Bot. 1957 : **44** : 381–90.

Compared with its normal sib, the single-gene mutant dwarf–1 (d_1) showed considerable reduction in elongation and growth rate of the coleoptile and mesocotyl, the coleoptile being less affected than the mesocotyl. The mesocotyl of the mutant increased in width at the same rate as that of the normal sib but was wider because of greater initial width in the embryo. Reduction in mesocotyl length was due to decrease in both cell multiplication and cell-wall extension, mitotic activity ceasing 7 days after sowing instead of continuing as in normal plants.

4003 Spasojević, S.
(The phenomenon of tillering in maize and its utilization in practice).
Zborn. Rad. Inst. Fiziol. Razvić. Genet. Selekc. (Rec. Trav. Inst. Physiol. Dévelopg. Génét. Sélect.)/Rev. Wk. Inst. Physiol. Develop. Genet. Select., Beograd 1956 : No. 4 : 87–100. [Serbian].

Forms developing 2–4 tillers were selected among inbreds of the land variety Osmak at Belgrade. Single-cross hybrids between some selected lines showed marked heterosis in respect of vigour and development of tillers.

4004 Brink, R. A.
A genetic change associated with the R locus in maize which is directed and potentially reversible.
Genetics 1956 : **41** : 872–89.

A detailed account is given of investigations referred to in Abst. 1739.

4005 Pfahler, P. L., Kramer, H. H. & Whistler, R. L.
Effect of genes on birefringence endpoint temperature of starch grains in maize.
Science 1957 : **125** : 441–42.

As measured by loss of birefringence, the gelatinization temperature of starch grains in water varied as follows according to endosperm genotype: *su*$_2$ and *du su*$_2$, about 55° C.; normal dent, *wx*, *du* and *du ha*, about 70° C.; *ha su*$_2$, 83·5° C.; and *ha*, 89·5° C. Data were also obtained suggesting that use of certain salt solutions may permit further differentiation of genotypes.

4006 Persidsky, M. D. & Duncan, R. E.
Liberation of nuclei and achromatic figures from maize endosperm.
Stain Tech. 1957 : **32** : 117–21.

A technique for the simultaneous liberation and staining of nuclei from sugary maize endosperm is described. Endosperm in the milk stage is crushed in acetocarmine, coarse fragments are removed and the remaining suspension boiled and centrifuged, the nuclei and mitotic figures sedimenting more rapidly than the cytoplasm.

4007 Bálint, A. & Kovács, A.
Vizsgálatok a kukorica fehérjetartalmának fokozására. (**Investigations on increasing the protein content of maize**).
Agrártud. Egy. agron. Kar Kiad. 1956 : **3** : No. 5 : Pp. 15.

The crude protein content of the progenies of crosses between varieties differing in content generally approached that of the parent with the lower value, but in two crosses it corresponded to the parental mean. In tests carried out at 17 stations in Hungary, crude protein content varied according to locality.

4008 Davidson, J. F. & Thompson, T. L.
Phytoserology versus genealogy in *Zea mays*.
Madroño, S. Francisco 1956 : **13** : 252–59.

The affinities of six maize samples of known pedigree were investigated by tube agglutination, ring precipitation and complement-fixation

testing. In some cases, affinity, as indicated by serological tests, corresponded with the known genealogy; in other cases the serological tests indicated affinity between unrelated forms.

4009 **Collections of original strains of corn, II. Report of the Committee on Preservation of Indigenous Strains of Maize.**
Nat. Acad. Sci., Nat. Res. Coun., Wash. 1955 : unpaginated. (Mimeographed).
Tabulated information is given on the geographical origin, local names, types, seed colour, maturation period and conditions of cultivation of samples numbered 5387–10922 in the collection made as the result of the activities of the above committee (cf. Abst. 517).

4010 Misra, D. K.
Relation of root development to drought resistance of plants.
Indian J. Agron. 1956 : **1** : No. 1 : 41–46.
In the maize hybrids K2234, K1639, K1830 and K1784, resistance to soil drought in pot experiments was associated with root development in the early stages of growth (cf. Abst. 3888).

4011 Hooker, A. L. & LeRoux, P. M.
Sources of protoplasmic resistance to *Puccinia sorghi* in corn.
Phytopathology 1957 : **47** : 187–91.
Among 300 maize lines from 10 countries, tested at the Wisconsin and Iowa Experiment Stations, 64 were found to possess seedling resistance to one or more of the 56 isolates of *P. sorghi* from the United States or Mexico. Some seedlings of the variety Cuzco, from Peru, were resistant to all isolates and the inbreds B38, GG208R and K148 were susceptible to only a few. Studies carried out so far on the inheritance of resistance indicate that it is due to dominant factors in 34 strains and recessive factors in 10 strains.

4012 Hooker, A. L.
Factors affecting the spread of *Diplodia zeae* in inoculated corn stalks.
Phytopathology 1957 : **47** : 196–99.
In susceptible maize lines inoculated at Iowa State College with *D. zeae* the spread of infection was rapid during the first two weeks after inoculation but decreased thereafter while in moderately resistant lines the rate of spread was fairly constant over a four-week period. No spread occurred in resistant lines after the first week.

4013 Jenkins, M. T., Robert, A. L. & Findley, W. R. (Jun.)
Genetic studies of resistance to *Helminthosporium turcicum* in maize by means of chromosomal translocations.
Agron. J. 1957 : **49** : 197–201.
In a study carried out by the Field Crops Research Branch of the US Department of Agriculture designed to investigate the position of genes determining resistance to *H. turcicum*, two resistant inbred maize lines, Mo21A and NC34, were crossed with two lines carrying translocations and endosperm markers. One series of translocations had been back crossed to R4 and the other to A188 and the semisterile F_1 progeny of crosses between these lines and Mo21A and NC34 were also back crossed to R4 and A188 and the back-cross progeny evaluated for blight incidence.
The results of tests with the R4 translocations indicated that resistance was associated with the short arm of chromosome I, the long arm of chromosome III and both arms of chromosome IV in both resistant lines. In the case of Mo21A the short arm of chromosome II was found to be associated with susceptibility. Tests with the A188 translocations and Mo21A indicated that resistance was associated with the long arms of chromosomes IV, V and VI and the short arms of VI and VII while with NC34 the long arms of chromosomes I and V and the short arms of IV and VII were associated with resistance.

4014 Nelson, R. R.
Heterothallism in *Helminthosporium maydis*.
Phytopathology 1957 : **47** : 191–92.
Monoconidial isolates of *H. maydis* have been found to be self-sterile, indicating that the fungus is heterothallic. Two compatibility groups were identified, designated *A* and *a*, and any member of one group normally produced perithecia with any member of the opposite group. Some isolates produced perithecia with others of the same compatibility group, indicating that other factors besides *A* and *a* govern perithecial formation.

4015 Douglas, W. A. & Eckhardt, R. C.
Dent corn inbreds and hybrids resistant to the corn earworm in the South.
Tech. Bull. US Dep. Agric. 1957 : No. 1160 : Pp. 13.
Data are provided on the response of a number of maize inbreds to the corn earworm in tests

in Mississippi, Alabama and Louisiana during 1943–51. Some inbreds were found to be highly resistant in some single crosses and less resistant in others, indicating that resistance may be controlled by a number of genes. Five white inbreds, L501, L503, F1, F2 and Mp313, and one yellow inbred, F6, transferred their high level of resistance to their single-cross progenies.

BARLEY

4016 Woodward, R. W.
A long-awned barley dwarf.
Agron. J. 1957 : **49** : p. 223.

Two recessive dwarf plants, both of which breed true in progeny tests, have been selected in Utah from among the progeny of Bonneville barley seed treated with thermal neutrons. Both dwarf lines have awns of normal length, with more barbs on the tips than the parent variety, and culms which are kinked in the upper half. One is highly sterile with culms 11 to 13 inches long, the other is shorter but possesses fairly good fertility.

4017 Anttinen, O.
Pohjois-Suomen ohralajikkeista. (**The barley varieties of North Finland**).
Koetoiminta ja Käytäntö 1956 : **13** : p. 12.

This summary of varietal trials carried out over a number of years in northern Finland includes data on the yield, straw qualities and growing period of a series of Finnish and introduced varieties.

4018 Borg, G.
Förädlingen av höstkorn. (**Breeding winter barley**).
Lantmannen, Stockholm 1957 : **41** : 113–14.

The topics discussed in this popular article, on the work of the Swedish Seed Association in developing winter barley, include testing of numerous varieties for resistance to mildew races, crossing of hardy, stiff-strawed spring barleys with winter varieties with the aim of improving the winter hardiness and straw of the latter, and the use of stiff-strawed mutants as parents.

Annual Meeting of the Malting Barley Improvement Association, Milwaukee, Wisconsin. Progress Report 1956 : Pp. 70. (Mimeographed).

4019 *Progress reports on barley variety testing, breeding and improvement in 8 states.* (*pp. 34–50*).

Feebar and B112 (Kindred x C17117–77) have shown good resistance to *Septoria* at the North Dakota Agricultural College, where many selections from Traill x B100 and Traill x UM570 have shown promise in yield tests. Material from the F_3 of Traill x Feebar back crossed to Traill, and F_3 and back-cross progeny of Traill x B112 is resistant to *Septoria* and some of the latter lines have also shown resistance to *Helminthosporium sativum*. Studies of the inheritance of resistance to stripe mosaic have been initiated.

Breeding for resistance to *Septoria* leaf disease and other diseases has continued at the University of Minnesota and at the South Dakota State College. The South Dakota selection 1776 has shown marked superiority over its sister selection 1761.

At Michigan State University, selection has continued among Montcalm crosses and back crosses for stiff straw and smut resistance and breeding for resistance to mildew has been begun. A breeding programme designed to investigate the inheritance of quality factors is in progress as are studies of the interaction between the genotype and the environment. The world collection has been sampled for lines possessing tolerance of low night temperatures.

Kindred has been used as the recurrent parent in crosses with several stiff-strawed, lodging-resistant varieties, at the University of Wisconsin, but so far the malting quality of Kindred has not been recovered although some progress has been made in retaining straw strength in the back-crossed lines. Other work in progress includes the use of X rays and thermal-neutron irradiation to induce mutations, back crossing Moore to Manchuria and selection and testing for disease resistance.

Work in progress at the Iowa Agricultural Experiment Station includes recurrent selection for yield among four crosses, a study of the effects of visual selection for yield in early-generation populations of Moore x (Peatland x Mariout), a study of means and variances among early-generation selections of three crosses grown in regions of high and low soil fertility, the analysis of heritability values for six agronomic characters in a Moore x (Peatland x Mariout) cross and heritability studies using regression analysis with 34 crosses in bulk populations.

At Montana State College crosses have been made between Carlsberg II and Betzes with a view to combining the high yield, stiff straw and malting quality of Carlsberg II with the hull characters of Betzes. Male-sterile mutants have been found in Freja, Betzes, Carlsberg II and

Heines Hanna and a back-cross programme is in progress designed to develop two-row and six-row counterparts of some existing varieties.

4020 *Some new barley varieties of potential importance.* (*pp. 51–53*).
Of the varieties mentioned UM570, Fox, Parkland and Traill have been dealt with in *PBA*, XXVI, Absts. 1287, 2144, 2326 and 3307 respectively. Betzes is a two-rowed, rough awned variety, with stiffer straw than Hannchen and Hanna, introduced from Poland. It has done well in trials on irrigated land in Montana. Heines Haisa II [(Heines Hanna x Ackermann's Isaria) x Weihenstephan Mildew Resistant] was introduced in 1956 from Germany and has shown promise in the Camas Prairie region of Idaho.

Report of the Barley Improvement Conference held at Hotel Nicollet, Minneapolis, Minnesota, Thursday, January, 31, 1957 : Pp. 54. (Mimeographed).

4021 *Hunt, L. A. Report on recommendations of Malting Barley Research Advisory Committee of Malting Barley Improvement Association.* (*pp. 7–17*).
The recommendations made by the above committee for strengthening the programmes of breeding and quality testing of malting barley in those states cooperating with the Malting Barley Improvement Association are summarized and discussed.

4022 *Lambert, J. W. Progress in breeding disease resistant varieties of malting barley.* (*pp. 20–26*).
The progress made so far and some future aims of barley breeding in the midwest are reviewed. Most of the work mentioned has already been summarized in *Plant Breeding Abstracts* from other sources.

4023 *Ladish, J. H. Malt Research Institute's evaluation of new barley varieties and selections grown in 1954 and 1955.* (*pp. 25–32*).
The characteristics of ten recently developed and some older varieties are described; most of them have already been described in *Plant Breeding Abstracts* from other sources.

4024 *Dickson, A. D. Report of experimental malting tests on barley varieties grown in 1955 and 1956.* (*pp. 43–49*).
Malting quality data are provided for 14 varieties and selections grown in the Mississippi Valley Uniform Barley Nursery.

4025 Patterson, F. L. & Shands, R. G. **Independent inheritance of four characters in barley.**
Agron. J. 1957 : **49** : 218–19.
Two methods of analysis carried out at Madison, Wisconsin, on the progeny of a cross between Valentine (CI 7242) and Rabat (CI 4979) indicate that independent inheritance operates with the factors determining hairiness of the leaf sheath, rachilla length, reaction to *Erysiphe graminis* var. *hordei* and *Puccinia graminis* var. *tritici*.

4026 Bahteev, F. H.
[The genetics of barley (crossing wild barley representatives, *Hordeum spontaneum* C. Koch., with cultivated forms of *Hordeum*)].
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1591–603. [Russian].
Crosses were made between *H. spontaneum* and fourteen forms of cultivated barley of different geographical origin. In all cases the main characteristics of *H. spontaneum* were dominant in the F_1; in time of maturity the F_1 was generally like the earlier parent but its behaviour sometimes varied in different localities; awnlessness and the two-rowed condition were incompletely dominant.
The F_2 too showed a predominance of the characteristics of the wild parent and most segregates were lower than the cultivated parent in fertility and yield and in resistance to *Erysiphe graminis* and *Puccinia simplex*. Segregation continued in the F_3 and very few of the lines bred true; almost all plants had a brittle rachis.

4027 Bahteev, F. H.
(The history of a "conversion" in documents).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 133–35. [Russian].
Correspondence between the Komarov Botanical Institute in Leningrad and the Lysenko Breeding and Genetics Institute in Odessa is published, from which it emerges that the "converted" spring barley Pallidum 32 referred to by Lysenko has been withdrawn from cultivation as being inferior in hardiness to Pallidum 17, which is an alternative variety obtained by crossing Pallidum 153 with Pallidum 281.

4028 **Cereal news from other countries.**
Cereal News 1957 : **3** : No. 1 : 28–36.
The release of three new barley varieties in the United States is reported. Heines Hanna, a two-rowed spring malting barley, has been

jointly released in Washington and Idaho, Forrest, a reselection of Br1136 (Newal x Peatland x OAC21) has been released for sale in Minnesota and Liberty, SD1776 (Lion x Manchuria 2 x Chevron 3 x Titan) in South Dakota.

4029 Dros, J.
The creation and maintenance of two spring barley varieties.
Euphytica, Wageningen 1957 : **6** : 45–48.

An account is given of procedures used in the development of the mildew-resistant fodder varieties Minerva and Vada from a 20-year-old population originating from *Hordeum laevigatum* x Goudgerst [Gold barley]. Both varieties are also suitable for producing pearled barley. It is suggested that crosses of *H. laevigatum* with varieties excelling Goudgerst in yield may lead to even better results.

4030 Erroux, J.
Les orges du Fezzan. (**The barleys of the Fezzan**).
Bull. Soc. Hist. nat. Afr. N. 1956 : **47** : 74–83.

A description is given of local barley varieties. Some are widespread in northern Africa. Others are peculiar to the Fezzan; these are mainly naked forms and are often characterized by purple grains.

4031 Wettstein, D. von
Chlorophyll-letale und der submikroskopische Formwechsel der Plastiden. (**Chlorophyll lethals and the submicroscopic structure of plastids**).
Exp. Cell Res. 1957 : **12** : 427–506.

An investigation of the physiology of gene action on the submicroscopic structure of plastids has been carried out with normal plants and lethal chlorophyll mutants of barley. The *albina* mutants show normal proplastids but differentiation does not proceed beyond the earliest stages, although the plastid almost reaches the size of a fully developed chloroplast. In the mutant *xantha*–3 blocking of development occurs at a later stage but differentiation of lamellae in the plastids does not occur. The plastids increase in size but their internal structure remains unorganized. No genetical blocking of chlorophyll synthesis was observed.

4032 **Proctor.**
Brew. Guild J. 1957 : **43** : No. 510 : 186–201.

The value of Proctor for producing pale-ale malt is discussed with reference to its pedigree and capacity of full modification at a low MSCW (matters soluble in cold water). It is suggested that in general the property of MSCW merits attention among breeders and brewers as an indication of malting quality.

4033 Horák, L.
Zjišťování sladovnických hodnot československého sortimentu jarních ječmenů. (**Determining the malting properties of Czechoslovakian varieties of spring barley**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **3** : No. 3 : 231–352.

A large collection of varieties, including many recent selections, were grown in varied environments and their grain yield and yield of malt and extract were determined. A number of varieties highly rated for yield of malt or extract are listed.

4034 Roman, T.
Przydatność różnych odmian jęczmienia jarego dla przemysłu przetwórczego namiastek kawowych. (**Suitability of different varieties of spring barley for the production of coffee substitutes**).
Roczn. Nauk rol. : Ser. A. : 1956 : **74** : 79–90.

Of sixteen barleys tested in Poland in 1952 and 1953, only the small-grained six-rowed variety Młochowski proved unsuitable for use as a coffee substitute.

4035 Postel, W.
Studien über exogene Aminosäuren in differenzierten Zonen von Gerstencaryopsen ökologisch verschiedener Standorte. (**Studies on exogenous aminoacids in different zones of barley caryopses from ecologically different habitats**).
Z. Pflanzenz. 1957 : **37** : 113–26.

Separate analyses of the endosperm and the outer layers, including the aleurone, showed that some 50% of the protein of the barley caryopsis was in these outer layers and the other 50% in the endosperm, the actual protein content of the outer layers being twice as high as that of the endosperm. Conditions leading to higher protein contents produced greater increases in the endosperm than in the outer layers. The protein from the aleurone layers contained 68% more arginine, 30% more lysine, 16% more threonine, 15% more methionine and 12% more histidine than the endosperm protein, whereas the endosperm protein was higher in phenylalanine. The biological value of the

aleurone proteins is calculated as 78 as compared with 67 for those of the endosperm. Thus an increase in protein content is accompanied by a reduction in its biological value. The only way to avoid this in breeding barley for higher protein content would be, it is suggested, to select at the same time for proteins of higher biological value.

4036 Day, A. D. & Dickson, A. D.
Association between nitrogen percentage and certain morphological characteristics in barley.
Agron. J. 1957 : **49** : 244–45.

Crosses of OAC21, having a low nitrogen percentage of the grain, with varieties possessing a high nitrogen percentage and each differing from OAC21 by one monofactorial character of known linkage group were investigated. Nitrogen percentage was associated with row number (group I), six-rowed segregates having a lower percentage than two-rowed. Nitrogen percentage was not associated with black *vs.* white hulls (II), naked *vs.* covered kernels (III), blue *vs.* white aleurone (IV) or rough *vs.* smooth awns (V).

4037 Svinarev, V. I.
(The question of the interrelationships between plants in artificial mixtures).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 57–61. [Russian].

Mixed sowings of three barley varieties had a much lower percentage of smut infection than was found on any of the three varieties sown alone. The yield of the mixture was equal to that of the highest-yielding component. On the other hand mixtures of only two varieties gave slightly reduced yields.

4038 Patterson, F. L. & Shands, R. G.
The amount of barley hybridization during artificial inoculation with *Ustilago nuda*.
Agron. J. 1957 : **49** : 217–18.

It has been shown at Madison, Wisconsin, that hybridization occurring during smut inoculations is relatively unimportant in studying barley variety and line reactions to *U. nuda*.

4039 Schein, R. D.
Pathogenic specialization in *Rhynchosporium secalis*.
Phytopathology 1957 : **47** : p. 246. (Abst.)

Studies of isolates of *Rh. secalis* from four American states have shown that at least five races can be differentiated on the basis of their ability to attack six barley varieties.

MILLETS AND SORGHUMS

4040 Ratnaswami, M. C. & Dhanaraj, L.
Evolution of a short duration strain in tenai or Italian millet (*Setaria italica* Beauv.) by hybridization.
Madras agric. J. 1957 : **44** : 59–62.

SI4894, taking 80–85 days to reach maturity, has been developed at the Millets Breeding Station, Coimbatore, Madras, from a cross between the long-duration standard Co.1 and SI3497, a selection from the local short-duration variety Salem. SI4894 has outyielded local varieties by 19% in district trials.

4041 Ratnaswamy, M. C.
Cleistogamous mutant in *Setaria italica* Beauv.
Curr. Sci. 1957 : **26** : p. 93.

A cleistogamous mutant without lodicules was found in the variety Co.3 at the Millets Breeding Station, Coimbatore, Madras. It also differed from normal plants in many other morphological respects.

4042 Krishnaswamy, N. & Raman, V. S.
Studies on the interspecific hybrid of *Pennisetum typhoides* x *P. purpureum*. IV. The cytogenetics of the allotetraploids.
Genetica 1957 : **28** : 345–60.

All the allotetraploids from the above cross derived by back crossing to *P. typhoides* were perennial and were found to have similar caryotypes ($2n = 28$) and all gave some trivalents at diakinesis. The main morphological characters and the frequencies of chromosome associations are tabulated. An allotetraploid derived from the F_2 progeny gave one, two or three quadrivalents.

It is suggested that *P. typhoides* possesses genome A, *P. purpureum* genomes AB and the allotetraploids derived by back crossing genomes AAAB. In spite of this, however, the hybrids show a greater morphological resemblance to *P. purpureum* and are rust resistant under field conditions. (Cf. *PBA*, XIX, Abst. 1837, XXIV, Abst. 2977 and XXV, Abst. 1137).

4043 Sikka, S. M., Mital, S. P. & Joshi, A. B.
Pistil-less off-type plants in *bajra* (*Pennisetum typhoides* Stapf and Hubbard).
Curr. Sci. 1957 : **26** : p. 114.

Two plants reduced in height and ear length and bearing florets without pistils were found in different varieties at the Indian Agricultural Research Institute, New Delhi. Stamens and

pollen production were normal. Inheritance of the lack of the pistils is to be investigated.

4044 Singh, D.
Smaller millets are in the news.
Indian Fmg. 1957 : **6** : No. 11 : p. 15.
Two high-yielding selections of *Echinochloa frumentaceum* collected in Uttar Pradesh and tested at Gorakhpur are described. Type 25 reaches maturity in about 70 days and produces medium, compact, erect ears which are light purple in colour. It has some lodging resistance. Type 46 closely resembles type 25 but has thicker ears and better lodging resistance and does not yield well in poor soils.

4045 Noda, A. & Hayashi, J.
(Studies on the coleorhiza of cereals. III. On the coleorhiza of *Echinochloa*).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **7** : 231–37. [Japanese].
Varietal differences are reported in oxygen intake and rate of coleorhiza elongation when the grains were germinated under water.

4046 Narasimhamurthy, B. L.
Ragi improvement work at Anakapalle.
Andhra agric. J. 1956 : **3** : 245–51.
This article includes a survey of early and more recent selection of *Eleusine coracana* at the Agricultural Research Station, Anakapalle, Andhra.

4047 Kennedy-O'Byrne, J.
Notes on African grasses: XXIX. A new species of Eleusine from tropical and South Africa.
Kew Bull. 1957 : No. 1 : 65–72.
Two suggestions are made regarding the origin of *E. coracana*; firstly, since the specimens of *E. coracana* from tropical Asia and Africa resemble *E. indica* while those from the highlands of Africa are more like the indigenous *E. africana*, that the two types of *E. coracana* originated separately from the *E. indica* and *E. africana* stocks; secondly that *E. africana* with $2n = 36$ originated by chromosome doubling from *E. indica* ($2n = 18$) and that the cultivated cereal was developed by selection of large-grain mutants from *E. africana*. A wide range of intermediates between the two tetraploid species occurs in Uganda, possibly as a result of hybridization between them. *E. africana* is newly described in this article, being distinguished from *E. indica* by its more robust habit, larger flower parts and tetraploid chromosome number.

4048 **Hybrid grain sorghum advance.**
What's New Crops Soils 1957 : **9** : No. 7 : 19–21.
Progress made in a number of states in the USA in the development of hybrid sorghum is described in this popular article. Brief descriptions of five red-grained hybrids suitable for combining are included.

4049 Venkataramana Reddy, T.
Sorghums of Andhra.
Andhra agric. J. 1956 : **3** : 265–68.
Sorghum spp. and varieties are described. A large number of ecotypes occur within each variety and attempts to develop a common variety for each zone by pure-line selection have failed. It is hoped that by interstrain hybridization widely-adapted strains will be obtained.

4050 Malik, H. C.
New jowar yields high grain and forage.
Indian Fmg. 1957 : **6** : No. 12 : **7**, 15, 40.
A new variety of *Sorghum vulgare*, 29/1, recommended by the Punjab Department of Agriculture, is characterized by high yields of white grain and of forage, late maturity and resistance to red leaf spot.

4051 Price, M. E. & Ross, W. M.
Cytological study of a triploid x diploid cross of *Sorghum vulgare* Pers.
Agron. J. 1957 : **49** : 237–40.
The authors describe meiosis in the parental triploid and aneuploid progeny referred to in an earlier paper (cf. *PBA*, XXVI, Abst. 2349). No association was detected between chromosome number and morphological characters or vigour. A complete set of primary trisomics for linkage studies could probably be obtained fairly easily from a $3n$ x $2n$ cross.

4052 Doggett, H.
Tetraploid varieties of *Sorghum vulgare*.
Nature, Lond. 1957 : **179** : p. 786.
According to preliminary data obtained at the Department of Agriculture, Ukiriguru, Tanganyika, the F_1 and F_2 of a cross between colchicine-induced autotetraploids of two strains had higher yields than the $4n$ parents and approached the level of yield given by diploids.

4053 Hsi, C. H.
Varietal differences in susceptibility of sorghum to chemical toxicity of a mercury compound (Panogen 15).
Plant Dis. Reptr. 1957 : **41** : 213–16.
Data are provided on the percentage germination

and percentage of normal seedlings of 18 sorghum varieties treated with Panogen 15 at different dosages at the New Mexico Agricultural Experiment Station. Sorgo, milo and hegari types were less affected than kafir or kafir-milo hybrids or derivatives.

4054 Krishnaswamy, N.
Tetraploid grain sorghum.
Madras agric. J. 1957 : **44** : 89–92.

At the Coimbatore Agricultural College and Research Institute perennial dual-purpose tetraploid types ($2n = 40$) suitable for grain and fodder production have been developed by twice back crossing hybrids of *Sorghum halepense* ($2n = 40$) x *S. durra* ($2n = 20$) on to desynaptic plants of *S. durra* as ♀.

RICE

4055 Sircar, S. M. & Roy, A.
Studies on the physiology of rice. XI. Vernalization and devernalization of winter and summer varieties.
Proc. nat. Inst. Sci. India 1956 : **22** : 102–11.

Seeds of one winter and one summer variety of rice were subjected to continuous high or low temperatures and to alternating temperatures for varying periods during germination at the Department of Botany, Calcutta University. Flowering was retarded in the winter variety, Rupsail, by continuous high or low temperatures but was accelerated by fluctuating temperatures between 12° C. and 37° C. In the summer variety, Dhairal, low temperatures accelerated flowering and high temperatures retarded flowering, some correlation being observed between the degree of departure from the normal and the temperature and length of treatment. Subsequent treatment by lower temperatures was found to counteract the effect of exposure to temperatures above 30° C. (cf. *PBA*, XXV, Abst. 2026).

4056 Piacco, R.
Orientamento per la costituzione di nuove varietà di riso. (**Orientation for the production of new varieties of rice**).
Sementi elette 1957 : **3** : No. 2 : 22–27.

The aims of rice breeding in Italy are discussed and two recently released varieties, Lomello and Roverbella, are described (cf. *PBA*, XXVI, Absts 2392 and 3379).

4057 Silva, M. V. e
Aperçu sur la culture et l'amélioration du riz au Portugal. (**Survey of the cultivation and improvement of rice in Portugal**).
Riz et Rizic. 1957 : **3** : 5–9.

A short review of the varieties grown in Portugal and of breeding work in progress is given.

4058 **Annual Reports of the Central Rice Research Institute, Cuttack for the years 1953-54** (1955) : Pp. 47; **and 1954-55** (1956) : Pp. 48.

Additions were made to the collection of genetic stocks, now consisting of 3150 types. *Indica* x *japonica* combinations were further selected for fertility, yield and grain characters under conditions of normal and heavy manuring. Sterility in the F_4 material ranged from 15·4 to 27·0%, whereas in the corresponding F_1 it had varied from 30 to 86·6%. Progress was made in developing early and productive strains from crosses within var. *indica*. Puangnak, Namdok-mai and AC1951, although not adapted to local conditions, are to be used as parents on account of their lodging resistance. The blast resistance of Co.25 behaved as a dominant character in the F_1 of a cross with the highly susceptible Co.13. BAM10, resistant to *Cochliobolus miyabeanus*, has been crossed with Co.25, to combine resistance to both diseases. PTB2 remained free from attack by gall fly (*Pachydiplosis oryzae*) and Co.21 from attack by stem borer (*Schoenobius incertellus*) in tests of the reactions of many varieties.
Study of variability in sterility of *japonica* x *indica* hybrids continued. Anthocyanin pigmentation in *japonica* x *indica* crosses was controlled by one to four genes, the ratio of pigmented : nonpigmented segregates varying according to the plant part and cross under investigation. Most of the genes had pleiotropic effects upon pigmentation but some genes were linked.

4059 Thysell, J. R.
Rice breeding investigations in California.
News Lett. FAO Internat. Rice Comm. 1957 : **6** : 14–18.

After outlining the climatic conditions to be considered and the performance of the older improved varieties, the author describes recent work with reference to tolerance of cold water, quality, straw strength, smooth-hulled selections, long-grained rice and glutinous varieties.

4060 **The work at the Rice Breeding Station.**
Fm. J. Brit. Guiana 1954 : **17** : 42–43.

A short historical account of rice breeding in British Guiana is given. Recent work has resulted in hybrid selections showing promise for mechanical harvesting.

4061 Jordan, H. D.
Hybridization of rice.
Trop. Agriculture, Trin. 1957 : **34** : 133–36.

Details are given of the technique used at the West African Rice Research Station, Rokupr, Sierra Leone. It involves use of a vacuum flask to envelop the panicle with hot saturated air and thus force open the flowers prior to emasculation or for the collection of ripe anthers. The anthers are applied directly to the emasculated spikelets.

4062 Harada, K., Watabe, T. & Umekage, O.
(On the occurrence of heterosis in experiments on rice crossing).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 7 : 131–33. [Japanese].

The F_1 of a cross between the nonglutinous variety Shina 2 [Chinese 2] and the glutinous variety Nan-ching-hsiang [Nanking Fragrant] was heterotic in respect of such characters as plant height, culm length and diameter, and number of grains.

4063 Beachell, H. M.
The use of X-ray and thermal neutrons in producing mutations in rice.
News Lett. FAO Internat. Rice Comm. 1957 : **6** : 18–22.

An account is given of the mutants induced in Bluebonnet 50 and Century Patna 321, in cooperative investigations of the US Department of Agriculture and Texas Agricultural Experiment Station. The most common changes in the R_3 were in grain length and plant height. Shorter-grained were more frequent than longer-grained types and were mostly found on plants of reduced height. Most of the mutants with respect to height were shorter than normal. They included some of Bluebonnet 50 which were 12–14 in. shorter than normal, with no reduction in grain length. Other changes included such features as rough hulls, the habit of freely shattering, extremely narrow leaves, chlorophyll deficiency and altered maturity. Sterility was pronounced in the R_1–R_3. The variations induced by X rays and thermal neutrons were in general similar.

4064 Okada, M. & Kato, I.
(On the sensitivity to photoperiod of the principal varieties grown in the North-Eastern Region).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 6 : 167–75. [Japanese].

The varieties investigated were arranged in three groups: (1) varieties in which heading period was markedly shortened by short days, (2) varieties in which heading period was markedly lengthened by long days and (3) varieties showing both effects. In general, early and mid-season varieties tended to be sensitive to long days; conversely, late varieties tended to be sensitive to short days.

4065 Doi, Y. & Yamagata, M.
(The effect of low-temperature treatment at night during the nursery period on early rice varieties).
Yamaguchi Dagaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Yamaguti Univ. 1956 : 341–47. [Japanese].

Low temperature (*ca.* 8·1° C.) at night under 16 hr. photoperiods delayed heading in four early varieties compared to the behaviour of the same varieties grown at high night temperatures. Optimum growing conditions after low-temperature treatment delayed heading still further.

4066 Yamagata, M.
(Studies on the upper limit of leaf number and grain number on the main stem of rice varieties. I. The effect of temperature and photoperiodic treatment during the nursery period on the leaf number and grain number on the main stem).
Yamaguchi Dagaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Yamaguti Univ. 1956 : 349–54. [Japanese].

Eighteen varieties were subjected to 16 hr. photoperiods and high or low night temperatures. Some early varieties developed more leaves on the main stem at low night temperatures. Two midseason varieties, Norin 22 [Ministry of Agriculture and Forestry 22] and Norin 37, failed to head at high night temperatures under the photoperiods applied.

4067 Harada, K., Watabe, T. & Kokubu, H.
(Experiments on early and late rice culture. The relations between the yield and various other characteristics of the varieties used).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 7 : 121–30. [Japanese].
The yielding capacity of a series of Japanese varieties was investigated when sown abnormally early or abnormally late. High yield after early sowing was correlated with length of vegetative period and panicle number; high yield after late sowing was correlated with panicle length.

4068 Harada, K. & Murakami, M.
(The results of hot-water treatment on the maturation process of rice pollen).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 8 : 132–40. [Japanese].
The fertilizing capacity of rice pollen is destroyed by hot-water treatment at 43 or 46° C. for 8 min. just before flowering. The viability of the ovules is not seriously affected.

4069 Batcher, O. M., Helmintoller, K. F. & Dawson, E. H.
Development and application of methods for evaluating cooking and eating quality of rice.
Rice J. 1956 : **59** : No. 13 : 4–8.
Using 8 g. samples, water absorption during cooking, volume of the cooked rice and the contents of total solids and starch of the liquid in which the grain had been cooked were determined for eight varieties. Varietal differences in each of these properties were noted. Grain type was however the chief factor in the case of the first three of these properties. Data from 100 g. samples of the same varieties, cooked in the oven for palatability evaluations, confirmed the importance of grain type in influencing water absorption and volume. The scores obtained for colour, cohesiveness, off-flavour and degree of being cooked are reported in relation to length of cooking time and to possible correlations with the results of the physical and chemical tests.

4070 Portères, R.
Taxonomie agrobotanique des riz cultivés *O. sativa* Linné et *O. glaberrima* Steudel.
(Agrobotanical taxonomy of the cultivated rices *O. sativa* Linné and *O. glaberrima* Steudel).
J. Agric. trop. Bot. appl. 1956 : **3** : 627–51; 821–32.
These two instalments conclude the taxonomic revision of the above species, the earlier parts of which were summarized in Absts. 3027–8. The following topics are presented: a key to the botanical forms within the 39 botanical varieties of *O. sativa* recognized by the author, notes on and etymological explanations of the epithets used, and a detailed taxonomic revision of *O. glaberrima*, based principally, as with *O. sativa*, on glume pigmentation.

4071 Niles, J. J.
Analysis of the sequence of flowering in rice.
Trop. Agriculturist 1956 : **112** : 305–12.
Analysis of the contribution of successive tillers to yield indicated that the main culm and tillers 2–7 account for 69–85% of the yield per plant. The breeder should therefore select strains in which the yield is mainly derived from the first seven tillers.

4072 Ramirez, D. A. & Umali, D. L.
The nature of lodging in rice.
Philipp. Agric. 1956 : **40** : 335–51.
Details are given of the amount of root and stalk lodging, the breaking strength of the stalks at weekly intervals from the boot stage to maturity and the relation between stalk lodging and several anatomical characters of nine lowland and nine upland varieties of rice, studied at the University of the Philippines College of Agriculture.

4073 Venkatachalam, S., Natarajan, C. P. & Mariakulandai, A.
Study of the free amino acids in paddy plants in relation to the incidence of blast disease.
Madras agric. J. 1957 : **44** : 157–58.
Paper-chromatographic analysis revealed greater concentrations of certain aminoacids in the blast-susceptible variety ADT10 than in the resistant Co.4.

4074 Koshairy, M. A. *et al.*
A study on the resistance of rice to stem borer infestations.
News Lett. FAO Internat. Rice Comm. 1957 : **6** : 23–25.
In the cross Giza 14 x Sydney A, resistance to stem borer was under polygenic control, although apparently only a few genes were involved. Dominance, as well as additive effects, probably played a part in determining resistance. Varieties with thinner culms were less susceptible than those with thicker culms. The standard Yabani Mont. 47 [Japanese Mont. 47] was attacked much less than most of the other varieties tested in 1956.

4075 FUKE, Y. & KOYAMA, T.
(On the resistance of rice to *Chlorops oryzae* and its genetics).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 6 : 155–66. [Japanese].

An extensive series of Japanese varieties was classified in respect of resistance to the above pest. The resistance of F_1 hybrids relative to that of the parents varied greatly, but was generally intermediate. Some evidence of a 1 : 2 : 1 segregation for susceptible, intermediate and resistant reactions to the pest, respectively, in the F_3 was obtained.

FORAGE GRASSES

4076 HUNT, I. V.
Comparative productivity of 27 strains of grass in the West of Scotland. Part 4. Seasonal growth.
J. Brit. Grassl. Soc. 1957 : **12** : 127–37.

Tabulated data are provided on the average daily production of dry matter in 1953 and 1954 of 11 varieties of perennial ryegrass, six of timothy, five of cocksfoot and three of meadow fescue at the West of Scotland Agricultural College, Auchincruive. (Cf. *PBA*, XXVI, Abst. 3387 and XXVII, Absts. 589 and 1850).

4077 VAN BOGAERT, G.
L'amélioration des herbes. Description de la méthode employée à la Station de Recherches de l'État pour l'amélioration des plantes, à Lemberge. **(The improvement of grasses. Description of the method employed at the State Research Station for Plant Improvement at Lemberge).**
Rev. Agric., Brux. 1957 : **10** : 429–38.

The selection methods used at the Lemberge research station, Belgium, for breeding forage grasses are described. This station has been transferred from Melle.

4078 EBERHARD, A. & BIERI, R.
Untersuchungen über die Befruchtungsverhältnisse und die Auswirkungen der Inzucht bei schweizerischen Stämmen von Futtergräsern. **(Investigations on the fertilization relationships and the effects of inbreeding in Swiss strains of fodder grasses).**
Landw. Jb. Schweiz 1957 : **71** : 189–99.

Sets of 3·1–4·2, 6·5–10·9, 1·2–5·1 and 0·2% were obtained from bagged inflorescences of *Dactylis glomerata*, *Arrhenatherum elatius*, *Lolium perenne* and *Trisetum flavescens* respectively; in the first three species sets of 25–40% were obtained when the inflorescences of two different plants were bagged together. Collections of *D. glomerata* made in different localities differed somewhat in the seed set on selfing, those from higher altitudes giving higher sets.

The plants produced from the selfed seeds gave some 50% less yield of dry matter than those from open pollination in *D. glomerata* and *A. elatius*; in *L. perenne* the reduction was somewhat more pronounced. There was a reduction of 10–20% in plant height in *D. glomerata* and *A. elatius* and in the number of inflorescences in *D. glomerata*.

4079 SKALIŃSKA, M. *ET AL.*
Further studies in chromosome numbers of Polish angiosperms.
Acta Soc. Bot. Polon. 1957 : **26** : 215–46.

Chromosome numbers of 43 monocotyledonous species pertaining to 28 genera are reported and include the following additions to previously known numbers: *Poa bulbosa*, $2n = 39$; *P. granitica*, $2n = 64$, 67, 71, 72 or 94; *P. nobilis*, $2n = 72$; *P. pratensis*, $2n = 74$, c.78 or c.80; and *Festuca tatrae*, $2n = 14$. It is noted that all material of *Nardus stricta* ($2n = 26$) was totally male sterile but produced apparently normal embryos.

4080 SJØSETH, H.
Undersøkelser over frostherdighet hos engvekster. **(Investigations on frost hardiness in meadow plants).**
Forskn. Fors. Landbr. 1957 : **8** : 77–98.

In field and laboratory freezing tests of seven diploid and four tetraploid red clovers, the diploids, with the exception of Øtofte Res. III, were more frost resistant than the tetraploids, the best being the diploids Vågønes 259 from northern Norway and $F261_{40}$–0_{112}–0, a selection from Molstad. Preliminary data on frost hardiness in four lucerne and four timothy varieties are also presented.

4081 **Report on a trial of strains of cocksfoot 1952 to 1955.**
Tech. Bull. Edinb. Coll. Agric. 1957 : No. 19 : Pp. 35.

Information on the performance of Danish, Trifolium I, Scotia, S26, S37 and S143 at Boghall, Scotland, is provided.

4082 MURAKAMI, M.
(Bulk emasculation methods for forage plants. II. Emasculation of cocksfoot by the hot-water method).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 7 : 134–38. [Japanese].

The optimum treatments were 15 min. at

43° C. or 30 min. at 41° C. (cf. *PBA*, XXV, Abst. 2058).

4083 Parodi, L. R.
Una nueva variedad de *"Cynodon dactylon"* cultivada en Tucumán. (**A new variety of *C. dactylon* cultivated in Tucumán**).
Rev. argent. Agron. 1956 : **23** : 185–87.

A form introduced into Argentina from Africa does not correspond to any referred to in the literature and is here described under the name *C. dactylon* var. *sarmentosum*. It is characterized by long stolons and freedom from underground rhizomes.

4084 Johnson, H. W.
Lamont—a new variety of rescuegrass.
Seed World 1957 : **80** : No. 7 : 8, 10.

The above-named variety of *Bromus catharticus* was developed at the Delta Branch Experiment Station, Stoneville, Miss., by mass selection from La Estanzuela strain 157/49 (PI 193144), obtained from Uruguay. It is superior to all other varieties tested in resistance to head smut, *Ustilago bullata*, and is also equal or superior in forage production. It is adapted to humid regions with mild winters and provides a long grazing season in the second and subsequent years after seeding since most of the plants are biennials or short-lived perennials.

4085 Markarian, D. & Schulz-Schaeffer, J.
A squash technic for root tips of polyploids in *Bromus*.
Stain Tech. 1957 : **32** : 147–48.

Root tips are placed in 0·002 M oxyquinoline for 12–20 hr. at 6° C. then transferred to 1% orcein in 45% acetic acid and heated gently and finally transferred to a slide previously coated with Haupt's adhesive. After maceration with a glass rod the unwanted tissue fragments are removed and the preparation covered and squashed.

4086 Schulz-Schaeffer, J. & Markarian, D.
Cytologische Untersuchungen in der Gattung *Bromus* L. II. Untersuchungen an Wurzelspitzen zur Klärung der Chromosomenmorphologie bei den Untergattungen *Ceratochloa* und *Bromus*. (**Cytological investigations in the genus *Bromus* L. II. Investigations on root tips to explain the chromosome morphology in the subgenera *Ceratochloa* and *Bromus***).
Z. Pflanzenz. 1957 : **37** : 299–316.

By means of the oxyquinoline method chromosome numbers were determined for 22 species, two of them, *B. danthonia* ($2n = 14$) and *B. viviparus* ($2n = 56$), for the first time; for *B. hookerianus* the number $2n = 28$ was found and a form previously (cf. *PBA*, XXVI, Abst. 3394) described as *B. inermis* was shown to have $2n = 63$ and is thought to be a hybrid of *B. riparius* x *B. inermis*; no asymmetric chromosomes were detected in mitosis in this hybrid. Details are given of the chromosome morphology, from which it is seen that certain chromosome types occur in several species, which are thus presumed to be related; this applies to *B. haenkeanus*, *B. cartharticus*, *B. valdivianus*, *B. viviparus*, *B. maritimus* and *B. laciniatus* in the subgenus *Ceratochloa*; the hybrid *B. riparius* x *B. inermis* in section *Festucaria* shows a certain affinity with this group too. Comparisons of this supposed hybrid with an artificially produced hybrid of the two species revealed a similarity in their meiotic behaviour in respect of the formation of 21 bivalents but a greater degree of pairing in the remaining chromosomes in the natural hybrids; consequently it is thought that the *B. riparius* parent may be an alloploid hybrid of the octoploid *B. inermis* and the diploid *B. ciliatus*. The hybrid *B. riparius* x *B. inermis* is distinguished by great vegetative vigour and may be of interest for cultivation. The assumed relationships of the species were supported by a classification of the SAT chromosomes; tandem satellites were observed only in the subgenus *Ceratochloa*, which also on morphological grounds stands apart from the sections *Zeobromus* and *Festucaria* and seems to have evolved separately.

4087 **Delta experiment station develops new grass.**
Sth. Seedsman 1957 : **20** : No. 4 : p. 44.

Bromus catharticus 'Lamont', developed by the US Department of Agriculture and the Delta Branch Experiment Station, Stoneville, Miss., is superior in head-smut resistance to all older commercial varieties. In forage yield it is inferior to no other variety (cf Abst. 4084).

4088 Jain, H. K.
Effect of high temperature on meiosis in *Lolium*: nucleolar inactivation.
Heredity 1957 : **11** : 23–36.

Following high temperature treatments, carried out at the Department of Agricultural Botany, Aberystwyth, for different periods before and during meiosis, the regular behaviour of chromosomes during meiosis was found to be upset in some clones of *L. perenne*. Nucleoli were formed by 1–7 bivalents while those bivalents not

forming nucleoli showed conspicuous retardation of DNA production and prophase condensation. Where all seven bivalents formed nucleoli normal condensation occurred but failure of spindle organization was observed.

4089 Snyder, L. A.
Apomixis in *Paspalum secans*.
Amer. J. Bot. 1957 : **44** : 318–24.

Biotypes of *P. secans* ($2n = 40$) in Puerto Rico were characterized by obligate pseudogamous apospory. The archesporium usually degenerated without division. When meiosis did occur, it was highly irregular and functional gametophytes were rarely, if ever, produced from the megaspores. Functional 8-nucleate embryo sacs were derived from nucellar cells. Egg-cell division was autonomous but endosperm development and caryopsis production depended on fertilization of the polar nuclei.

4090 Hertzsch, W.
Mutationsversuch mit Rohrglanzgras (*Phalaris arundinacea*). (**Mutation experiment with *Ph. arundinacea*).**
Z. Pflanzenz. 1957 : **37** : 263–79.

Doses of X rays exceeding 16,000 r. were found to reduce the germination capacity of treated seeds and air-dry seeds of a selected land race were irradiated therefore with 6000–12,000 r. The resulting plants were selfed by bagging, the set of grain varying in different plants from almost nil to practically 100%. A number of plants in the F_2 generation deviated from the type and were classed as mutants, though some of them may have arisen simply by segregation and may not be directly ascribable to the treatment. They included plants showing a variety of chlorophyll deficiencies, red leaf tips, variegation, various growth anomalies and non-shedding grains. The last-named type is thought to be of possible interest for seed production and is being further studied.

4091 Townsend, C. E.
A study of some types of floral abortion and sterility in Sudan grass (*Sorghum vulgare* var. *sudanense* Hitchc.) and the nature of inheritance of these characters
Diss. Abstr. 1956 : **16** : Publ. No. 17,346 : p. 2006.

Complete sterility due to absence of sexual organs was controlled by a single recessive gene. Random, nonrandom and chimeral types of partial sterility were distinguished. Random occurrence of partial sterility in the panicle is attributed to cryptic chromosomal changes. The amount of pollen abortion was more variable in the nonrandom than in the random type. Abnormal pistil development was also found in the former type, which is said to be due to genes whose action was modified by some unknown factor. The chimeral type is believed to be genetic in origin but its causes were not determined.

4092 Dedecca, D. M.
As espécies brasileiras do gênero *Axonopus* (Gramineae). [**The Brazilian species of the genus *Axonopus* (Gramineae)**].
Bragantia 1956 : **15** : 251–96.

The systematic position of the genus is discussed with reference to the literature and a key for the determination of its species is presented, followed by descriptions of the species found in Brazil; these include four species previously classed under *Paspalum*.

4093 Emery, W. H. P.
A cyto-taxonomic study of *Setaria macrostachya* (Gramineae) and its relatives in the southwestern United States and Mexico.
Bull. Torrey bot. Cl. 1957 : **84** : 94–105.

On the basis of cytotaxonomical and population studies, *S. macrostachya* is separated into three species: *S. texana* ($2n = 36$) sp. nov.; *S. macrostachya* ($2n = 54$); and *S. leucophila* ($2n = 54$, 68, 72). The taxonomic limits of *S. scheelei* and *S. villosissima*, both having $2n = 54$, were also clarified.

4094 Emery, W. H. P.
A study of reproduction in *Setaria macrostachya* and its relatives in the southwestern United Sates and northern Mexico.
Bull. Torrey Bot. Cl. 1957 : **84** : 106–21.

S. texana, *S. scheelei*, *S. macrostachya* and the 72-chromosome form of *S. leucophila* reproduce sexually, whereas *S. villosissima* and the 54- and 68-chromosome forms of *S. leucophila* are agamospermic (cf. Abst. 4093). Apomixis usually involved degeneration of the sporogenous and gametophytic tissues, apospory and pseudogamy. Aposporous *S. leucophila* was shown to be facultatively apomictic. Embryo sacs developed from reduced megaspores in both sexual and facultatively apomictic species were of the 8-nucleate *Polygonum* type. The 3-celled aposporous embryos in *S. leucophila* and *S. villosissima* contained one synergid, one egg and two polar nuclei.

4095 Bohmont, B. L. & Lang, R.
Some variations in morphological characteristics and palatability among geographic strains of Indian ricegrass.
J. Range Mgmt. 1957 : **10** : 127–31.
Twelve strains of *Oryzopsis hymenoides* from various localities in the USA and Canada showed inherent differences in growth habit, leaf type and size and shape of the seed. The strains differed in palatability for rabbits. Palatability and chromogen content were not closely associated.

4096 D'Cruz, R.
Seed abortion in *Elymus-Sitanion* allopolyploids.
Proc. Indian Acad. Sci. 1957 : **45** : 247–62.
Seed sterility in F_1 hybrids of *E. glaucus* x *S. hystrix* and C_2 allopolyploids of *E. glaucus* x *S. jubatum* and *E. glaucus* x *S. hystrix* previously studied by Stebbins and Vaarama (cf. *PBA*, XXIII, Abst. 1254) was primarily due to abnormalities of the maternal tissue, occurring before the embryo sac was fully developed or 2–3 days after fertilization. Genic interaction rather than cryptic structural hybridity is believed to be responsible for the abnormalities.

4097 Morrison, K. J. & Wolfe, H. H.
Greenar intermediate wheatgrass.
Ext. Circ. Inst. agric. Sci. St. Coll. Wash. 1957 : No. 272 : unpaginated.
Agropyron intermedium 'Greenar' is a late-maturing variety recommended for certain conditions in eastern Washington State. Its origin is not given.

4098 Pigden, W. J. & Heinrichs, D. H.
The lignin content of six clonal lines of intermediate wheatgrass.
Canad. J. Pl. Sci. 1957 : **37** : 128–31.
Selections of *Agropyron intermedium* differed significantly in lignin content and leafiness. Significant seasonal differences in lignin content were also detected. The line with the finest stems had the lowest content of lignin. Lignin content was however more closely associated with leafiness than any other factor.

4099 Wolfe, H. H. & Morrison, K. J.
Whitmar beardless wheatgrass.
Ext. Circ. Inst. agric. Sci. St. Coll. Wash. 1957 : No. 273 : unpaginated.
Agropyron inerme 'Whitmar', a selection developed from material collected in the Palouse prairies, is long-lived and drought resistant compared with *A. cristatum*, its season of use is later and it is slower in becoming established.

LEGUMINOUS FORAGE PLANTS

4100 Lesins, K.
Cytogenetic study on a tetraploid plant at the diploid chromosome level.
Canad. J. Bot. 1957 : **35** : 181–96.
A more detailed account of the author's work on lucerne, summarized in *PBA*, XXIII, Abst. 1256, is given and the results are discussed in relation to the origin of polyploids, disomic and tetrasomic segregation ratios and the significance of tetraploidy in evolution.

4101 Sprickschen, G.
Beitrag zur Kenntnis der französischen Luzerne. (**Contributions towards knowledge of French lucerne**).
Diss. Univ. Bonn 1955 : Pp. 42.
Studies were made in the Rhine Valley on 41 lucernes collected in different parts of France, together with certain others from Germany and elsewhere and a number of breeders' varieties. Data are presented on yield of green matter and dry matter in two successive years, protein content, growth habit, time of flowering, flower colour and root form.
The variations in flower colour showed that none of the types collected represent pure *Medicago sativa* forms and all have suffered to a greater or lesser degree the effects of hybridization with *M. falcata*. The highest percentage of hybridization was detected in the German lucerne Binsheimer which was very much like a pure F_1 of *M. sativa* x *M. falcata*; the next in order of hybridity were the lucernes from northern France and eastern Germany and those with the lowest degree were the types from Provence, western France and Italy. Some parallelism was observed between these observations and those based on root form, lucernes from Italy and southern France having 70–80% of tap roots of the *M. sativa* type and Binsheimer lucerne only 25%; the lucernes of the Flamande and Marais types also had a relatively low proportion of tap roots. The southern lucernes of the *M. sativa* type gave higher yields in the first year of growth but were overtaken by the hybrid types in the second year and surpassed in the third. Altfränkische [Old Franconian] lucerne and those from eastern Germany were intermediate. Various combinations of the characters concerned were observed, such as tap roots with high yield and winter hardiness in the Ormelong lucerne and branching roots with low yield in the Marais type, so that it is not possible on the basis of these characters alone to establish the degree of hybridity. The highest yields

were given by the lucernes from northern France, followed by those from Bohemia and then the German bred varieties. Those from northern France and the French bred varieties had the highest dry matter content but the lowest crude protein content. No correlation was observed between root weight and yielding ability. In winter hardiness the French breeders' varieties were markedly superior to the local lucernes, even those of northern France; those from Provence and Italy were the least hardy. The lucernes from northern France showed the highest tolerance of cutting, Binsheimer the lowest. The Binsheimer lucerne proved immune from *Pseudopeziza medicaginis* and many of the forms from northern France also remained free from attack.

4102 Lesins, K.
Note on pollination conditions as a possible source of variation in alfalfa forage yields.
Canad. J. Pl. Sci. 1957 : **37** : 174–75.

The yields of open-pollinated, hand-intercrossed and clonal progenies of selected mother plants of Ferax were determined at the University of Alberta. The open-pollinated progenies yielded on the average only 68% of the crossed. This lower yield appeared to be due to extensive self pollination. The results suggested that significant positive correlation between the yields of a mother plant and its open-pollinated progeny may be expected if selfing has prevailed, whereas no significant relationship may be found if crossing has predominated in open pollination. Significance of the results in relation to procedures of evaluating combining ability of polycrosses and yields of varieties and strains is indicated.

4103 Murakami, K., Kaneko, K., Sekijo, T. & Kojima, S.
[**On the effect of 3 different factors (variety, calcium and cutting frequency) and the interactions between them on the yield and nutritive value of alfalfa**].
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1957 : No. 72 : 59–71. [Japanese].

Differences in the green-matter, dry-matter and crude-protein contents of six varieties introduced from the USA are noted.

4104 Shinners, L. H.
***Medicago polymorpha* var. *vulgaris*.**
Rhodora 1956 : **58** : p. 310.

The combination *M. polymorpha* var. *ciliaris* proposed by the author for the common American bur clover is illegitimate (cf. *PBA*, XXVI, Abst. 3423). The correct designation is *M. polymorpha* var. *vulgaris* (Benth.) comb. nov.

4105 Dobson, R. C. & Watts, J. G.
Spotted alfalfa aphid occurrence on seedling alfalfa as influenced by systemic insecticides and varieties.
J. econ. Ent. 1957 : **50** : 132–35.

The synthetic New Mexico 16 (cf. Abst. 1373) and Lahontan were noteworthy for their high degree of inherent tolerance of *Pterocallidium* (*Therioaphis*) sp.

4106 Multamäki, K.
Puna-apilan satotuloksia Jokioisista vuosilta 1954–56. (**Red clover yields at Jokionen in the years 1954-56**).
Koetoiminta ja Käytäntö 1956 : **13** : p. 39.

Red clover variety trials were grown on clay soil in Finland in 1953 and comparative data are given for winter hardiness and hay yields in the three years following. Tammisto was used as standard. Various foreign varieties were tested, including the Swedish tetraploid WR28. The Jokioinen strain Jo37 did particularly well.

4107 Schulze, E.
Photoperiodische Versuche an mehrjährigen Futterpflanzen. (**Photoperiodic experiments with perennial forage plants**).
Z. Acker- u. PflBau. 1957 : **103** : 198–226.

Flowering was suppressed entirely in red clover by a 12-hr. day; in an 18-hr. day material from Germany, the Netherlands and England flowered earlier than that from Denmark and Sweden, the latest of all being that from Molstad in Norway, which flowered best in a 24-hr. day. In this strain the highest yield of green matter was given in 18–24-hr. days, whereas a German strain, Steinacher, gave its highest yield in 12–15-hr. days and flowered best in 15–18-hr. days.
It is pointed out that if any of these strains is reproduced at latitudes far removed from its place of origin the adverse effects of the changed photoperiod may lead to natural selection against the forms typical of the race.

4108 Tjutjunnikova, V. A.
(**More care in the seed growing of red clover**).
Lën i Konoplja (Flax & Hemp) 1957 : No. 4 : 29–31. [Russian].

At the Williams Forage Institute, intervarietal open pollination of some cultivated varieties and land races improved the seed set, the size of the

inflorescences, hardiness and yield of forage in the first and second year. Material originating from Molotov, Sverdlovsk and other provinces with different climatic and soil conditions from Moscow showed higher yield increases than local strains.

4109 Tjutjunnikova, V. A.
(The sowing of hybrid clover).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 4 : 37–38. [Russian].

This report is substantially the same as that referred to in Abst. 4108.

4110 Denward, T.
Nya erfarenheter beträffande sterilitetsallelernas effekt hos rödklöver. (**New observations regarding the effect of sterility alleles in red clover**).
Nord. JordbrForskn. 1956 : **38** : 310–15.

Inbred families were obtained by inducing increased self fertility through grafting (cf. *PBA*, XXV, Abst. 3135). Diallel crosses indicated that two incompatibility alleles were present in each inbred family, S_1 being dominant over S_2 in the female and also exerting a dominant effect on S_2 gametes in the male parent, so that the crosses S_1S_2 x S_1S_2 and S_2S_2 x S_2S_2 are incompatible while S_1S_2 x S_2S_2 and the reciprocal yield two classes of progeny, S_1S_2 and S_2S_2. S_1 is described as a labile allele and the heterozygotes as labile plants. In one I_1 family and its progeny, all plants were labile, possibly as a result of gamete selection.

4111 Hodgson, H. J., Wilder, W. B. & Osguthorpe, J. E.
Alaskland red clover.
Circ. Alaska agric. Exp. Sta. 1953 : No. 20 : Pp. 6.

Alaskland is a single-cut type whose origin is ascribed to natural crossing involving several Russian introductions, followed by a period of natural selection at Fairbanks, Alaska. Its outstanding attribute is winter hardiness.

4112 Lielmanis, Ja.
(The red clover Stendskiĭ Pozdnespelyĭ II).
Latv. PSR Zināt. Akad. Vestis. 1956 : No. 11 : 71–75. [Russian].

Stendskiĭ Pozdnespelyĭ II [Stend Late II] was bred from a local Latvian form. It is hardy, long-lived and shows resistance to *Sclerotinia* rot. In recent trials in Latvia and the provinces of Pskov and Kaliningrad it has outyielded all other varieties.

4113 Förädling av rödklöver för resistens mot stjälknematod. (**Breeding red clover for resistance to stem eelworm**).
Lantmannen, Stockholm 1957 : **41** : p. 451.

At the Ultuna branch of the Swedish Seed Association different degrees of resistance to *Ditylenchus dipsaci* have been found among varieties and local strains of red clover. The inheritance of resistance appears to be controlled largely by a few major genes and work is in progress to transfer resistance from such highly resistant varieties as Merkur to susceptible locally adapted red clovers. Stem nematodes are found to invade both resistant and susceptible plants but in the former they are unable to multiply. Differences in virulence have been observed among different nematode populations.

4114 Bingefors, S.
Resistens mot stjälknematod hos rödklöver. (**Resistance to stem eelworm in red clover**).
Nord. JordbrForskn. 1956 : **38** : 407–10.

In the highly resistant red clover Merkur, resistance was independent of locality, but less resistant varieties varied in reaction according to district, possibly as a result of differences in the nematode populations of different areas. Although nematodes were able to invade both Merkur and the susceptible variety Ultuna, their development was inhibited in 90% of the plants of the former variety.

4115 Bingefors, S.
Studies on breeding red clover for resistance to stem nematodes.
Växtodling 1957 : No. 8 : Pp. 123.

Improved resistance to *Ditylenchus dipsaci*, together with improved winter hardiness, has been obtained in Sweden by means of selection within existing red clover varieties. No clear indication was obtained that doubling the chromosome number improves resistance and the mechanism of inheritance of resistance is still in doubt (cf. *PBA*, XXVI, Abst. 3432). The methods of selection and testing used in the investigation are described in detail; among them a method of detecting resistance at the seedling stage has proved particularly useful.

4116 Gibson, P. B.
Effect of flowering on the persistence of white clover.
Agron. J. 1957 : **49** : 213–15.

"Persistence and flowering of white clover were studied under normal daylight and daylight extended by use of lights. The relative lack of

persistence of profuse-flowering white clover which occurred in some strains under normal daylight and was induced in other strains by the extended daylight indicated that flowering reduced persistence. The flowering and persistence of Ladino from seed produced at different latitudes for several generations were different under the extended daylight."

[Author's summary].

4117 Davern, C. I., Peak, J. W. & Morley, F. H. W.
The inheritance of flowering time in *Trifolium subterraneum* L.
Aust. J. agric. Res. 1957 : **8** : 121–34.

Flowering time was inherited on a polygenic basis, about 90% of the genetic variance being additive. In an analysis of eight of the parents, repeatability of varietal behaviour with respect to flowering time was 86%. From data on F_2 selections and their progeny a mean parent-offspring regression of 0·86 was obtained for six of the hybrids studied.

4118 Picard, J.
Premières observations sur l'hérédité de quelques caractères simples chez le trèfle incarnat (*Trifolium incarnatum* L.). [**First observations on the heredity of some simple characters in crimson clover (*T. incarnatum* L.)**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1956 : **6** : 527–29.

The following genetic observations are reported: (1) albinism may be caused by a single recessive gene or by the interaction of two recessive genes; (2) absence of chlorophyll but not of xanthophyll and the other leaf pigments is controlled by a single recessive gene; (3) floral pigmentation is determined by the gene pair *Cr cr*, *Cr* producing red flowers, *cr* white flowers; and (4) the character two entire seedling leaves, instead of the usual one entire leaf, is controlled by a single recessive gene.

4119 Hely, F. W.
Symbiotic variation in *Trifolium ambiguum* M. Bieb. with special reference to the nature of resistance.
Aust. J. biol. Sci. 1957 : **10** : 1–16.

A number of diploid, tetraploid and hexaploid plants of *T. ambiguum* from several sources were inoculated in Canberra with 60 strains of *Rhizobium trifolii* from Australia, four from Asia Minor and four from New Zealand. None of the New Zealand strains and only one Australian strain showed any degree of effectiveness and with this strain the diploid plants were found to be slightly less resistant to infection than the tetraploid. Nearly all the Australian strains of *Rh. trifolii* were found to be effective on *T. repens* and ineffective on *T. subterraneum*. The Turkish strains were all more effective in forming nodules on *T. ambiguum* and ineffective on *T. repens* and *T. subterraneum* and no differences between strains were noted. In this case the diploid plants were slightly more resistant to infection than either the tetraploid or hexaploid. It is concluded that ineffectiveness is influenced both by the host plant and the bacterial strain involved.

4120 **Breeders make progress toward finer sericea.**
What's New Crops Soils 1957 : **9** : No. 7 : p. 30.

Lines of *Lespedeza cuneata* which have lower tannin contents and are more uniform in height and maturity have been developed by the USDA by X-ray treatment and selection. Better seed has been obtained from ungrazed and uncut fields, since under these conditions the plants produce more large, cross-pollinated flowers.

4121 Hackbarth, J.
Die Gene der Lupinenarten. III. Weisse Lupine (*Lupinus albus*). (**The genes of the lupin species. III. *L. albus*).**
Z. Pflanzenz. 1957 : **37** : 185–91.

In nature *L. albus* is much less variable than the other two species studied (cf. Absts. 3124–5) and much higher doses of X rays were found necessary to induce mutations. Descriptions are given of a number of mutants that have been found, affecting plant colour, habit, root formation and alkaloid content; some of these genes have similar effects to genes previously described in *L. luteus* and *L. angustifolius*. Three genes conditioning low alkaloid content have so far been identified. Several of the induced mutants are distinguished by short stature and early maturity.

4122 Olszewska, M. J.
Wpływ glukozy na elementy strukturalne jądra u *Lupinus albus* L. (**The influence of glucose on the structural elements of the nucleus in *L. albus* L.).**
Acta Soc. Bot. Polon. 1957 : **26** : 61–77.

After starvation by removal of the cotyledons and culture in distilled water for 15 days (cf. *PBA*, XXVI, Abst. 858) followed by transference to media containing glucose in various concentrations, seedlings showed an immediate increase in the numbers of chromocentres in the nuclei of the elongating zone of the root and the cortical parenchyma of the hypocotyl, the increase apparently depending on the amount

of glucose. From 10 to 48% of the nuclei had more than two nucleolar chromocentres, with attached Feulgen-positive granules. Soon after transference to a glucose medium, nuclei with 2-4 nucleoli were seen, which later fused to form a single large nucleolus. Mitosis occurred in the root apex 24 hours after transference to glucose.

4123 Atabekov, I. G.
(Selection of the lupin for earliness according to the dates of shedding of the cotyledon leaves).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : **61** : No. 6 : 107–09. [Russian].
Observations at the Timirjazev Agricultural Academy that early shedding of cotyledons in *Lupinus angustifolius* is correlated with a short growth period formed the basis for selection of new forms which are 10 days earlier than the commonly cultivated varieties 173 and 645.

4124 Shama Rao, H. K. & Solomon, S.
Flower structure and anthesis in the genus *Alysicarpus*.
Proc. Indian Acad. Sci. 1957 : **45** : 216–24.
Information is given on the floral biology of *A. pubescens*, *A. longifolius*, *A. buplurifolius*, *A. vaginalis* and *A. rugosus* vars. *styracifolius* and *heyneanus*, as observed at the College of Agriculture, Poona.

ROOTS AND TUBERS

4125 Simon, J.
Előzetes beszámoló répa fajhibridekről. **(Preliminary report on interspecific hybrids of beet).**
Növénytermelés 1956 : **5** : 227–40.
Hybrids with $2n = 36$ have been obtained from *Beta trigyna* x diploid beetroot and from *B. trigyna* x diploid sugar beet. The former hybrids were successfully back crossed to tetraploid mangel and the latter to tetraploid beet. In both crosses, the characters of *B. trigyna* were mostly dominant, but the red coloration of the beetroot was also transmitted to the progeny. *B. patellaris* x tetraploid mangel gave weak hybrids which survived only when germinated in nutritive solution and grafted on to the stem of a flowering beet plant. Hybrids of sugar beet with diploid monogerm *B. lomatogona* from Turkey and tetraploid, largely multigerm *B. lomatogona* from Belgium resembled the wild parent in their strong red coloration. Hybrids of *B. maritima* and beetroot have also been obtained and appear to be frost resistant.

4126 Stoppelknollen, 1957. **(Turnips, 1957).**
Landbouwvoorlichting 14 : Bijl. 11; Ber. Rassenkeuze 1957 : No. 228 : Pp. 7.
Information on the retention of green colour in the leaves, frost resistance, adherence of soil, resistance to club root and content and yield of dry matter is provided for 20 turnip varieties described in the official Netherlands varietal list and for ten varieties still undergoing trial.

4127 Krug, H.
Das photoperiodische Verhalten der Kartoffel (*Solanum tuberosum*).—Eine Übersicht. [**The photoperiodic behaviour of the potato (*S. tuberosum*). A survey**].
Angew. Bot. 1957 : **31** : 29–44.
The topics discussed in this review include: methods of determining photoperiodic reaction; effects of photoperiodic treatment on growth and development of various organs; effects of temperature and other environmental factors on photoperiodic reaction; criteria of photoperiodic behaviour; and the practical applications of the above information, especially to breeding.

4128 Meurman, H.
Perunan lajikekokeet Karjalan kasvinviljelykoeasemalla 1953–56. **(Potato variety trials at the Karjala trial ground, 1953-56).**
Koetoiminta ja Käytäntö 1956 : **13** : 38–39.
Variety trials carried out on the dry soil of the Karjala trial ground, Finland, with several Finnish and foreign potato varieties and certain lines from Jokioinen and Tammisto are described. Data are given on tuber yield and quality and incidence of blight on the tubers and stems.

4129 Pohjanheimo, O.
Perunan lajikekokeista ja jalostustyöstä Maatalouskoelaitoksen kasvinjalostusosastolla. **(Potato variety trials and breeding work at the Plant Breeding Department of the Agricultural Experiment Station).**
Koetoiminta ja Käytäntö 1956 : **13** : p. 31.
A general description is given of the behaviour of several Finnish and foreign potato varieties, with regard to resistance to blight and virus diseases, yield and quality. Three new lines bred at Jokioinen are mentioned: Jo 265/53, Jo 095 and Jo 0119.

4130 MELARD, V.
Où en est l'amélioration de la pomme de terre en Belgique? (**How is the potato being improved in Belgium ?**).
Ann. Gembl. 1957 : **63** : 94–104.
The following topics are reviewed: sources of resistance to the major diseases and pests, hybridization procedure, testing, and recently bred Belgian varieties.

4131 LAUMONT, P. & CHEVASSUS, A.
Note sur le choix des variétés de pommes de terre adaptées aux diverses régions et saisons de culture en Algérie. (**Note on the choice of potato varieties adapted to the various regions and seasons of cultivation in Algeria**).
Ann. Inst. agric. Algér. 1956 : **10** : No. 3 : Pp. 42.
The results of varietal tests at the Maison-Carrée research station and subsidiary centres in Algeria are reported. Most of the varieties tested are introductions; some local selection of these has been done.

Abstracts of papers presented at the Annual Meeting of the Potato Association of America.
Amer. Potato J. 1957 : **34** : 75–83.

4132 *Johansen, R. H. Field resistance of the potato selection ND 457–1 to virus Y.* (*p. 76*).
A high degree of field resistance to virus Y has been shown by ND 457–1, the movement of the virus within the plant being delayed.

4133 *Krantz, F. A., Eide, C. J., Lauer, F. & Knutson, K. Breeding for field resistance to late blight.* (*p. 77*).
Early clones simplex for R_1 or R_2 for late-blight immunity, and also possibly possessing field resistance, have been developed.

4134 *Mills, W. R., Niederhauser, J. S. & Hougas, R. W. Blight resistance of selected Solanum hybrids in Mexico.* (*p. 78*).
Clones of *S. demissum* selected for a high degree of resistance to *Phytophthora infestans* were crossed with 15 susceptible diploid species. Back crosses to Katahdin were mostly susceptible. Back crosses to *S. stoloniferum*, a species moderately resistant to late blight in Mexico, were in general about as resistant as their F_1 parents; in several cases resistance was however enhanced.

4135 *Rieman, G. H., Hooker, W. J., Krantz, F. A. & Werner, H. O. Potato improvement through parental line breeding.* (*p. 79*).
Cf. Abst. 3155.

4136 *Webb, R. E. & Schultz, E. S. A test for resistance to Verticillium wilt in potato.* (*p. 82*).
Techniques of greenhouse tests of the reaction of seedlings and clones to *V. albo-atrum* are described. Isolates highly pathogenic to the resistant variety Houma have so far not been discovered.

4137 BOOCK, O. J.
Variedades de batatinha (*Solanum tuberosum* L.). 1—Comportamento de 12 variedades procedentes da Holanda, Alemanha e Suécia. [**Varieties of potato (*S. tuberosum* L.). 1. Behaviour of 12 varieties originating from Holland, Germany and Sweden**)].
Bragantia 1956 : **15** : 153–68.
Brazilian observations were made on development, on resistance to drought, *Phytophthora infestans*, *Alternaria*, leaf roll, nematodes and scab and on yielding ability. Konsuragis and Prinslander were the most resistant to drought and Linda to *Ph. infestans*.

4138 STEINECK, O.
Photoperiodismus und Kartoffelzüchtung. (**Photoperiodism and potato breeding**).
Bodenkultur 1957 : **9** : 263–74.
All potatoes, it is submitted, fail to form tubers when a certain length of day is exceeded and are in this respect short-day plants. The limit varies for different varieties and for some it is so high that their behaviour for all practical purposes may be described as day-neutral. Seedlings from selfings and crosses of European cultivated varieties showed segregation in respect of the limit of day length beyond which they would not form tubers; those seedlings in which the limit is relatively low should be discarded as unsuitable for European conditions; such seedlings can usually be recognized when growing in pots in long summer days by the fact that the majority of the stolons tend to grow upwards rather than into the ground; by selecting in this way it is possible to eliminate some 80% of the seedlings in the first season.
The forms with a high limit of day length generally have a reduced tendency to flower

under long days; they can be induced to flower more profusely by increasing the day length.

4139 Engel, K.-H.
Grundlegende Fragen zu einem Schema für Arbeiten mit Inzuchten bei Kartoffeln. (**Basic questions for a system of work with inbred lines in potatoes**).
Züchter 1957 : **27** : 98–124.

An examination of the pedigrees of a number of German potato varieties lends little support to the supposition that conscious or unconscious use has been made of heterosis by crossing related inbreds and experiments were set up to test the existence of heterosis effects in potatoes. No differences in yield and other characters were observed in reciprocal crosses. No negative correlation between self fertility and yield was observed in the material studied. The results of inheritance studies are often disturbed by faulty germination and the best germination was obtained when the seeds were removed from the berries in the autumn, before Christmas, and the seeds were germinated in soil or soil extract. Experiments made to determine the size of population required showed that 100 plants were sufficient to judge a progeny in respect of any four characters. However, fairly significant differences in tuber yield were detectable between different inbred progenies of four varieties, Mittelfrühe [Midearly], Aquila, Merkur and a strain of *Solanum andigenum* referred to as Voldagsen when only 20 plants per clone were analysed; with smaller numbers the reliability of the differences became gradually less but fairly reliable results were still obtained when 5 or 10 plants per clone were used. A correlation of $r = +0{\cdot}93$ was obtained between eye estimations of the yields per clone and the actual yields obtained by weighing the tubers. The degree of correspondence between the values for two successive years was about 40% in respect of tuber yield, somewhat higher for starch content, tuber number and tuber weight, and about 60% for attack by *Phytophthora infestans*.

4140 Hawkes, J. G.
Potato breeding in Russia—July, 1956.
Euphytica, Wageningen 1957 : **6** : 38–44.

Basing his account on a three-weeks' visit, the author describes (1) the organization and work of the various institutes concerned, (2) methods and results of breeding for resistance to late blight, wart, frost, Colorado beetle, *Epilachna* and eelworm, and (3) the status of cytogenetical studies. Useful interspecific hybridizations are mentioned. Comments are also made upon the virtual absence of breeding for resistance to viruses and the lack of any scheme of seed certification at the present time, this situation being attributed to the past influence of Lysenko.

4141 Gottschalk, W.
Das Konjugationsverhalten partiell homologer Chromosomen im Pachytän von Artbastarden. (**The conjugation relationships of partially homologous chromosomes at pachytene in interspecific hybrids**).
Ber. dtsch. bot. Ges. 1956 : **69** : No. 11 : 13–14.

A brief account is given of work on *Solanum* hybrids described more fully elsewhere (cf. *PBA*, XXVI, Abst. 2570).

4142 Wangenheim, K.-H. von
Untersuchungen über den Zusammenhang zwischen Chromosomenzahl und Kreuzbarkeit bei *Solanum*-Arten. (**Investigations on the connexion between chromosome number and compatibility in *Solanum* species**).
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 21–37.

Normal endosperm development and seed production were observed in selfings of *S. acaule* and in crosses of *S. acaule* (4*b*) x *S. phureja* (2*b*). In the crosses *S. simplicifolium* (2*b*) x *S. goniocalyx* (2*b*) and *S. vernei* (2*b*) x *S. goniocalyx* (2*b*) some ovules developed normally whereas in others the cell walls failed to develop. This also occurred in a number of diploid x polyploid combinations, viz. *S. acaule* (4*b*) x *S. acaule* (8*b*), *S. goniocalyx* (2*b*) x *S. tuberosum*, *S. phureja* (2*b*) x *S. tuberosum*, *S. vernei* (2*b*) x *S. tuberosum*, *S. acaule* (4*b*) x *S. tuberosum* and *S. stoloniferum* (4*b*) x *S. tuberosum*. A number of successive nuclear divisions without cell-wall formation often took place but the cells were all deficient in cytoplasm and the seeds, when formed, had defective endosperm. In polyploid x diploid combinations, e.g. *S. acaule* (8*b*) x *S. acaule* (4*b*), *S. vernei* (4*b*) x *S. vernei* (2*b*), *S. tuberosum* x *S. goniocalyx* (2*b*), *S. tuberosum* x *S. vernei* (2*b*) and *S. tuberosum* x *S. phureja* (2*b*), and in *S. tuberosum* x *S. stoloniferum* (4*b*), the cells had a very high cytoplasm content, continued to divide for some time and only degenerated in the later stages of endosperm development.

It is pointed out that the wild tetraploid species *S. acaule* and *S. stoloniferum* in all these crosses behaved like diploids and the hexaploid species *S. demissum* and *S. spectabile* like artificial tetraploids or *S. tuberosum*. Compatability is evidently determined not only by ploidy but by

the constitution of the genomes. In many crosses compatibility is increased when one of the parents is doubled and in these crosses the functioning of unreduced egg cells is especially frequent, as in the crosses *S. vernei* (2*b*) x *S. tuberosum*, *S. chacoense* (4*b*) x *S. goniocalyx* (2*b*), *S. goniocalyx* (2*b*) x *S. tuberosum*, *S. simplicifolium* (2*b*) x *S. tuberosum* and *S. acaule* (4*b*) x *acaule* (8*b*).
The first signs of degeneration were always observed in the endosperm rather than in the embryo and the suggestion is made that the degeneration is caused not by disturbance of the chromosome-number relationships of maternal, endosperm and embryo tissues but by alteration of the quantitative relationship between plasmon and genome, since very little if any cytoplasm is contributed by the pollen parent.

4143 Nurmiste, B. H.
(Concerning the degeneration of some interspecific vegetative hybrids of the potato).
Agrobiologija (Agrobiology) 1956 : No. 5 : 114–24. [Russian].

Experiments at the Estonian Institute of Plant Industry showed that graft hybrids between different species of potato and also between tomato and potato give degenerate tuber progenies even though the initial components were healthy. In most plants arising from the degenerate tubers, common potato viruses were identified, but in others the causal organism has not been established. It is thought that graft hybridization between distantly related species disrupts the normal interchange of proteins and nitrogenous compounds in the plant and thereby promotes the development of harmful proteins or potato viruses.

4144 Miller, J. C.
Rushmore, a new oblong baking type potato.
Amer. Potato J. 1957 : **34** : 68–69.

Rushmore (Katahdin x Green Mountain), a russet type, has given its best performance in the northern potato-producing areas of the USA, where it behaves as an early to medium-early variety. Although only moderately high in yielding ability, it produces a high percentage of first-grade tubers.

4145 Höppner, E.
Zur Sortensystematik des derzeitigen Kartoffelsortimentes. **(The varietal classification of the present potato collection).**
Kartoffelbau 1957 : **8** : p. 99.

Tabular descriptions are given of new varieties that appeared in Germany in 1955, 1956 and 1957, with indications of those varieties to which they are most closely related.

4146 Grupče, R.
(Determination of some important potato varieties from Serbian territory).
Zborn. Rad. Inst. Fiziol. Razvić. Genet. Selekc. (Rev. Wk. Inst. Physiol. Develop. Genet. Select.)/Rec. Trav. Inst. Physiol. Dévelopg. Génét. Sélect., Beograd 1956 : No. 4 : 135–46. [Serbian].

Cytological analyses of 12 biotypes showed that all of them had 48 chromosomes. They were characterized by irregular reduction division at meiosis. During pollen grain development, dyads and triads were formed in addition to tetrads. Morphological descriptions are given of the biotypes, most of which were identified as forms of Early Rose, Wohltmann or Agronomski [Agronomic].

4147 Beamish, K. I., Cooper, D. C. & Hougas, R. W.
Induced tetraploid *Solanum* species and species hybrids: meiosis and use in breeding.
Amer. J. Bot. 1957 : **44** : 305–10.

Chromosome doubling was induced in the diploids *S. rybinii*, *S. saltense*, *S. rybinii* x *S. saltense* and *S. tarijense* x *S. rybinii* by colchicine treatment. In the F_1 of crosses of C_1 individuals ($2n = 48$) with *S. tuberosum* 'Katahdin', 70% of the plants examined had $2n = 48$, most of the remainder having $2n = 47$ or 49. Loss of chromosomes and multivalent formation were observed in both the C_1 and F_1. In view of the $2n$ numbers found in the F_1, the more unbalanced gametes were apparently eliminated in the C_1. The F_1 plants set seed freely upon back crossing to Katahdin. The $2n$ species and hybrids seemed to be of similar value as starting points in breeding.

4148 Nordnes, T., Emanuelsen, H. K. & Werenskiold, B. Q.
Matpoteten belyst ved norske analyser. **(The table potato in the light of Norwegian analyses).**
Forskn. Fors. Landbr. 1957 : **8** : 43–59.

Data are presented on the ascorbic acid content of the cooked tubers, peeled or unpeeled, of various potato varieties after different periods of storage.

4149 Malinowski, E., Bańkowska, H. & Oskierka, I.
Badania nad szczepieniem ziemniaków. III. Zmienność *Solanum Rybinii* szczepionego na pomidorze. IV. Szczepienie *Solanum Commersonii* na podkładce pomidorowej. V. Stolony napowietrzne *Solanum polyadenium* szczepionego na pomidorze. (**Investigations on grafting potatoes. III. Variation in *S. Rybinii* grafted on tomato. IV. Grafting *S. Commersonii* on to tomato stocks. V. Aerial stolons in *S. polyadenium* grafted on tomato**).
Acta agrobot., Warszawa 1956 : **5** : 33–61.

Increased flowering and self fertility were induced in scions of the self-sterile species *S. rybinii* (cf. *PBA*, XXIV, Abst. 1212), *S. commersonii* and *S. polyadenium* on tomato stocks without lateral shoots, the tomatoes used being Golden Jubilee and wild varieties of *Lycopersicon esculentum* from Mexico. In *S. rybinii* on Golden Jubilee, flowering was improved by long days and phosphorus fertilizer treatment. A little seed was also obtained on selfing scions of *S. commersonii* on Golden Jubilee stocks with two young lateral shoots. In no case was selfed seed obtained on stocks with fruit-bearing lateral shoots.

4150 Nagata, T.
(**Studies on breeding potatoes for high starch content. I. On mass selection of tubers from potato seedlings by means of specific gravity determinations in salt water**).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1957 : No. 72 : 36–40. [Japanese].

A high positive correlation was found between the specific gravity and starch content of the tubers in the progenies of three potato crosses. An association was also noted between high starch-content, resistance to late blight and late maturity.

4151 Brücher, H.
Kritische Betrachtungen zur Nomenklatur Argentinischer Wildkartoffeln. III. Die Serie *Cuneoalata*. (**Critical considerations concerning the nomenclature of the Argentine wild potatoes. III. Series *Cuneoalata***).
Züchter 1957 : **27** : 77–80.

The series in question comprises a small group of wild potatoes from an arid area of the Cordillera at altitudes from 3000 to 4500 m. and all are resistant to drought and low temperatures. A thorough study of the species in their original habitat has made it evident that the species *Solanum microphyllum* (= *S. xerophyllum*) and *S. platypterum* described by Hawkes are merely members of a wide range of variants that occur within *S. infundibuliferum*, and that *S. glanduliferum* is probably a hybrid of that species with some aromatic species of the *S. tilcarense* group. A German translation of the original description of *S. infundibuliforme* by Philippi is provided and cytological examinations are reported which show that all the forms in question, including *S. microphyllum*, have the same chromosome number, $n = 12$.

4152 Gern, A. P.
(**Hardy potato varieties**).
Agrobiologija (Agrobiology) 1956 : No. 5 : 146–47. [Russian].

Mention is made of Petrovskiĭ and 49038, obtained by interspecific hybridization involving *Solanum demissum* at the Petrovskaja Breeding Station, Penza province. They are midseason types with leaves tolerant of −3·7° C., show resistance to *Phytophthora* and *Synchytrium* and produce high quality tubers with flesh which does not discolour on cutting.

4153 Virnes, M. E.
Kostean ja kuivan kasvukauden vaikutuksesta perunan satoon ja laatuun. (**The effect of wet or dry growing periods on the yield and quality of potatoes**).
Koetoiminta ja Käytäntö 1956 : **13** : p. 5.

The effects of comparative rainfall at different stages of the growing season in 1954 and 1955 in Finland on a number of potato varieties are discussed. Data are given on tuber yield, starch content, length of growing period and incidence of disease.

4154 Saloheimo, L.
Poutakesän viljelykokemuksia. (**Observations on crop production during the dry summer**).
Koetoiminta ja Käytäntö 1956 : **13** : p. 11.

In this general discussion of growing conditions during the dry summer of 1955 data are given on the comparative yield of potato varieties under these conditions. Figures are also given for starch content, proportion of small tubers and blight resistance.

4155 Filippov, A. S.
(**Valuable potato varieties bred by S. A. Ležepekov**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 3 : 20–23. [Russian].

Descriptions are given of Uljjanovsk (Deodara

x Smyslovskiĭ), Volžanin [Volga Dweller] (Epicure x Katahdin), Vyrypaevskiĭ (Lorh x Jubel), Jugovostočnyĭ [South-eastern] (Epicure x Jubel) and Seedling 1750–4 (Early Rose x Centifolia), all of which have recently been made standards in the arid south-eastern districts of the USSR. All are productive midseason types, resistant to drought, with good keeping properties and flavour. Some are resistant to wart or other diseases.

4156 Stapp, C. & Spicher, G.
Zur Frage der Resistenzverschiedenheiten pflanzlicher Wirte gegenüber pathogenen Bakterien und ihre Ursachen. I. Untersuchungen mit *Erwinia phytophthora*, dem Erreger der Schwarzbeinigkeit und Knollennassfäule der Kartoffel. **(On the question of the differences in resistance of plant hosts to pathogenic bacteria and their causes. I. Experiments with *E. phytophthora*, the agent responsible for black leg and bacterial soft rot in potato).**
Zbl. Bakt. 1955 : **108** : 465–81.

Of 28 Solanaceous species artificially inoculated with *E. phytophthora*, only *Cyphomandra betacea* was highly resistant. *Solanum dulcamara* and *S. parodii* showed some resistance, *S. pinnatisectum* and *S. stoloniferum* less and all *Nicotiana* species proved susceptible. Appreciable intraspecific and within-plant variation was observed. The resistant reaction occurred only in living shoots. No evidence of the presence of a bacteriostatic or bactericidal agent in resistant shoots was obtained and it is suggested that resistance results from a local reaction inhibiting destruction of the cell wall by pectinase and associated with the capacity of the plant to form wound tissue. Wounds in susceptible plants could still be infected after a week, whereas in resistant plants wounds healed within a day.

4157 Tomiyama, K., Takase, N., Sakai, R. & Takakuwa, M.
(Physiological studies on the resistance reaction of potatoes infected with late blight. I. The variation in physiological reaction at different stages and intervarietal differences in this respect).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 71 : 32–50. [Japanese].

The metabolic activities of tuber slices of resistant and susceptible varieties were compared after inoculation with *Phytophthora infestans*. In the case of resistant varieties, the respiration rate and content of protein, starch and polyphenols rose initially; later the content of protein and polyphenols fell. These changes did not occur in susceptible varieties.

4158 van der Plank, J. E.
A note on three sorts of resistance to late blight.
Amer. Potato J. 1957 : **34** : 72–75.

The author discusses (1) racial resistance due to the *R* genes, (2) resistance associated with late maturity, and (3) the type of resistance which may be inferred from the difference in susceptibility between varieties belonging to the same maturity group, e.g. Sebago and Green Mountain. Type (3) has so far proved to be inadequate in early varieties solely of *Solanum tuberosum* origin. Two possibilities of breeding early-maturing varieties with stable resistance are examined: the *R* genes may confer a type of resistance other than racial; and an untapped source of the third type may exist in wild tuber-bearing species other than *S. demissum*.

4159 Cochran, F. D.
Estudio de los problemas del cultivo de la papa en el Perú. **(Study of problems of potato cultivation in Peru).**
Inf. Esp. Progr. Coop. Exp. Agropec., Lima 1956 : No. 9 : Pp. 33.

After an account of the chief varieties of *Solanum andigenum* and other species grown in Peru and information on prevalent diseases and their control, work in progress at various experimental stations is outlined, reference being made to the development of blight-resistant material, using *S. antipoviczii* and *S. tuberosum* varieties as sources of resistance. The report concludes with detailed recommendations for further work, including maintenance of varieties, further breeding, research on diseases, pests and soils and seed production.

4160 **Late blight investigations. Committee report 1956.**
Amer. Potato J. 1957 : **34** : 108–11.

The report of the Late Blight Investigations Committee of the Potato Association of America is given. The establishment of a uniform set of differential hosts and the maintenance of pure cultures of races of the pathogen have been considered. The Committee advocated the development of true-breeding lines of *Solanum demissum* as differentials so that plants for race identification could be produced from seed.

More reliance is being placed upon the polygenic type of resistance found in various *S. tuberosum* seedlings, the aim of some breeders being to combine all the known dominant major genes for resistance with a high degree of polygenic resistance. In Mexico, only the polygenic type has provided effective control. Some accessions of *S. demissum* carry genes for both types of resistance. The value of other species such as *S. bulbocastanum*, *S. stoloniferum* and *S. pinnatisectum* is also being explored but this work has been hampered by cross sterility. Race surveys indicate that most of the races of the International series have occurred in North America and Mexico. In addition, isolates more highly specialized than race 1,2,3,4 have been found in Canada and Mexico. Evidence of the mutability of the fungus, particularly with respect to the character of race 4, has been obtained. The recent discovery of mating groups in Mexico raises the question of the possible origin of new races through recombination. So far only one of the mating groups has been detected in North America.

4161 Heidrick, L. E. & Thurston, H. D.
Sources of resistance to late blight in Colombia.
Amer. Potato J. 1957 : **34** : p. 58. (Abst.)
Field resistance to at least ten races of *Phytophthora infestans* has been transmitted from some clones of *Solanum andigenum* and *S. rybinii* to the progeny of crosses between these and other species.

4162 Gallegly, M. E. & Galindo, J.
The sexual stage of *Phytophthora infestans* in Mexico.
Amer. Potato J. 1957 : **34** : p. 58. (Abst.).
Two compatibility groups have been found among isolates from several localities in Mexico. They are distinguished by their ability to mate with either isolate 256 from the USA or isolate 43 from Mexico.

4163 Rothacker, D.
Beiträge zur Resistenzzüchtung gegen den Kartoffelnematoden. I. Prüfung von Primitiv- und Wildkartoffeln auf das Verhalten gegenüber dem Kartoffelnematoden. (**Contributions towards breeding for resistance to potato eelworm. I. Testing primitive and wild potatoes for reaction to the potato eelworm**).
Züchter 1957 : **27** : 124–32.
A large collection of *Solanum* species was tested in a highly infested field at Gross-Lüsewitz in eastern Germany, the variety Aquila being used as control. With the exception of four populations of *S. vernei* all forms tested proved susceptible, though differences in degree were observed and most specimens were less heavily attacked than Aquila. A relatively low degree of attack was observed in certain representatives of *S. acaule*, *S. polyadenium*, *S. stoloniferum* and members of the series *Demissa* and *Commersoniana*.

4164 Dunnett, J. M.
Variation in pathogenicity of the potato root eelworm (*Heterodera rostochiensis* Woll.,) and its significance in potato breeding.
Euphytica, Wageningen 1957 : **6** : 77–89.
An eelworm population collected from a garden in Edinburgh, Scotland, was aggressive upon *Solanum tuberosum* ssp. *andigena* 'CPC1673', 'CPC1685' and 'CPC1690' and upon material obtained by hybridization of these clones with *S. tuberosum* (cf. *PBA*, XXIII, Absts. 2799 and 2800). Resistance in *S. vernei* was maintained. The aggressive population multiplied at a normal rate on commercial varieties. About 10% of the populations in 113 soil samples from Scotland and East Anglia were aggressive upon test plants propagated from a hybrid seedling carrying the gene *H* for resistance, derived from CPC 1673 (cf. *PBA*, XXIV, Abst. 2181).

4165 Oostenbrink, I. M.
Het aardappelaaltje (*Heterodera rostochiensis* Wollenweber), een gevaarlijke parasiet voor de eenzijdige aardappelcultuur. [**The potato root eelworm (*H. rostochiensis* Wollenweber), a dangerous parasite for potato monoculture**].
Versl. PlZiekt. Dienst Wageningen 1950 : No. 115 : Pp. 230.
In the section on testing and breeding for resistance (pp. 103–122), it is reported that of about 35 registered Netherlands potato varieties tested in infested soil in 1946–48, none was resistant. Late potatoes did better than early varieties, the most tolerant being Rode Star [Red Star]. Eighteen wild South American tuber-forming species were also susceptible as were over 20,000 seedlings of cultivated varieties, numerous wild species and interspecific hybrids tested in 1948. A single *Solanum demissum* sample and a few *S. andigenum* plants appeared to show some resistance.

4166 Huysman, C. A.
Veredeling van de aardappel op resistentie tegen *Heterodera rostochiensis* Wollenweber. (**Breeding the potato for resistance to *H. rostochiensis* Wollenweber**).
Meded. Sticht. PlantVeredel., Wageningen 1957 : No. 14 : Pp. 85.

Huijsman, C. A.
Veredeling van de aardappel op resistentie tegen *Heterodera rostochiensis* Wollenweber. (**Breeding the potato for resistance to *H. rostochiensis* Wollenweber**).
Proefschr. LandbHoogesch., Wageningen 1957 : Pp. 85.

A detailed account is presented of work previously reported in *PBA*, XXIV, Abst. 2181, and XXVI, Abst. 505. Evidence of the occurrence of double reduction was obtained from crosses between susceptible *Solanum tuberosum* lines and various resistant *S. andigenum* clones. Root exudates from both resistant and susceptible material were able to hatch cysts and equal numbers of larvae invaded the resistant and susceptible individuals from the same cross; but few or no female larvae reached maturity in the resistant plants. In reciprocal grafts between susceptible and resistant plants, no effect of scion upon rootstock was observed. A crossing programme involving *S. andigenum* and *S. tuberosum* is in progress at Wageningen, Netherlands, with the aim of obtaining combined resistance to eelworm, blight and other diseases. In tests carried out in Peru, the resistant clone CPC1673 was severely attacked by eelworms in soil from the Tarma region, indicating the occurrence of a race differing from that occurring in the Netherlands.

4167 Mackiewicz, S. & Turowski, W.
Wrażliwość różnych odmian ziemniaków na uszkodzenie masy zielonej. (**Sensitivity of different potato varieties to damage of the green parts**).
Roczn. Nauk rol. : Ser. A : 1957 : **74** : 421–36.

Turowski, W.
Wrażliwość różnych odmian ziemniaków na utratę masy zielonej. (**The sensitivity of different potato varieties to loss of green parts**).
Ibid. : Ser. A : 1957 : **74** : 470–72.

Four potato varieties were tested for tolerance of Colorado beetle attack by having varying percentages of leaves removed at periods corresponding to the feeding periods of the larvae and adult beetles. Late potatoes showed better regeneration after damage than early varieties but no intervarietal differences in loss of yield were observed.

4168 Payen, O. & Madec, P.
Sur la présence en France d'un nouveau virus de la pomme de terre. (**On the presence of a new potato virus in France**).
CR Acad. Agric. Fr. 1957 : **43** : 265–67.

Payen, O. & Madec, P.
Un nouveau virus de la pomme de terre. (**A new potato virus**).
Pomme d. Terre franç. 1957 : **20** : No. 213 : 20–22.

A new virus, first isolated from the variety Ratte, is described. Its characteristic symptoms are a leaf mosaic accompanied by slight inrolling of the leaflets. Inoculation tests on 53 varieties showed varietal differences in degree of infection.

4169 Arenz, B.
Die Ausbreitung der Viruskrankheiten (Blattroll- und Strichelkrankheit) der Kartoffel in Abhängigkeit von Sorte und Umweltsbedingungen. [**The distribution of virus diseases (leaf roll and streak) of potato as determined by variety and environmental conditions**].
Bayer. landw. Jb. 1956 : **33** : 657–74.

Data are given concerning the degree of infection of the different potato varieties tested in Bavaria in the years 1953–55. The varieties Augusta, Apta and Adelheid proved highly resistant to leaf roll and Sieglinde, Apta, Maritta, Forelle [Trout] and Oberarnberger Frühe [Oberarnberg Early] to virus Y. With the exception of Apta, most of the varieties resistant to the one virus proved more than usually susceptible to the other. The resistance of Apta to leaf roll is due to hypersensitivity, whereas Augusta possesses a certain degree of true resistance; the tuber progeny of Apta therefore have a much lower leaf-roll infection and examination of the progeny from selfing showed that 44·4% of them displayed the hypersensitive reaction.
Various environmental factors that affect infection by the two viruses are discussed.

4170 **New early sweetpotato.**
What's New Crops Soils 1957 : **9** : No. 7 : p. 31.

Earlysweet, developed by the Georgia Coastal

Plain Experiment Station, is recommended for its high, early yields and excellent baking quality when freshly dug.

4171 Ting, Y. C., Kehr, A. E. & Miller, J. C.
A cytological study of the sweet potato plant, *Ipomoea batatas* (L.) Lam. and its related species.
Amer. Nat. 1957 : **91** : No. 858 : 197–203.

The chromosome number of seven sweet potato varieties was found at Louisiana State University to be $n = 45$ with frequent secondary association of bivalents at metaphase I in all cases studied. This association is thought to indicate that the modern sweet potato is an amphidiploid which probably originated as a hybrid between a diploid and a tetraploid species and that diploidization has not yet been completed. The chromosome numbers of others species were found to be $n = 15$ in *I. asarifolia, I. carnea, I. arborescens, I. pendula* and *I. quinquefolia* and $n = 30$ in *I. gracilis* (*I. fastigiata*) and *I. tiliacea.* No F_1 hybrids were obtained in crosses between *I. batatas* as the female parent and 24 other species or between *I. batatas* as male parent and nine other species. It is concluded that the sweet potato could not have originated from *I. tiliacea.*

4172 Menezes, O. B. de & Nunes, W. de O.
Indice de viabilidade do pólen de *Ipomea batatas* (L) Lam. [**Index of viability of the pollen of *I. batatas* (L) Lam.**].
Rev. Agric., Piracicaba 1957 : **32** : 49–52.

The majority of the 59 varieties examined had good pollen viability but even those in which the proportion of fertile pollen was as low as 24% showed no meiotic irregularities, beyond occasional lagging and association of bivalents in groups of 2 or 3, which was observed with equal frequency in all varieties.

4173 Lewis, D. A. & Morris, L. L.
Effects of chilling storage on respiration and deterioration of several sweet potato varieties.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 421–28.

Varietal differences in the effects of chilling temperatures upon the rate of respiration, susceptibility to decay and mould, sprouting and external appearance of the stored roots are described.

4174 Hsi, C. H.
Experiments with, and diseases on, sweet potatoes in eastern New Mexico, 1953-55.
Res. Rep. N. Mex. agric. Exp. Sta. 1956 : No. 8 : Pp. 10. (Mimeographed).

Details are given of the yield and other horticultural characters and of the reaction to *Ceratostomella fimbriata, Rhizopus nigricans, Monilochaetes infuscans, Meloidogyne* spp. and cracking of 17 varieties of sweet potato tested for three years in New Mexico. Sunnyside, B–5999, Kandee and B–5868 were resistant to all diseases during the three-year period. Sunnyside gave the best average yields and Sunnyside, Kandee and Allgold showed the best general and storage quality.

4175 Steinbauer, C. E.
Types of sweetpotato cuttings for most precise evaluation of *Fusarium* wilt susceptibility.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 394–99.

In connexion with breeding, the value of successive four-node cuttings of the stem as material for testing reactions to *F. oxysporum* f. *batatas* in the greenhouse was investigated. The most sensitive reactions were shown by tip cuttings.

FIBRES

4176 Bhat, N. R. & Desai, N. D.
Genetic investigations of the whorled mutant in *Gossypium herbaceum.*
Genetics 1956 : **41** : 915–29.

The authors supplement their previous analysis of the inheritance of anthocyanin pigmentation, branching habit and number of loculi in *G. herbaceum* with F_3 data and now arrive at the following conclusions (cf. Abst. 1266). The "cluster-short branch" and whorled mutant are respectively dependent upon the complementary linked genes cl_2^{BH} and cl_2^{Wh}, situated on the same side of locus R_2. Recombination values obtained for cl_2^{BH} and R_2^{OS} and for cl_2^{Wh} and R_2 were respectively 30% and 11·3%. Number of loculi is governed by the complementary pseudoalleles loc^{2-3} for 2–3 and loc^{4-5} for 4–5 locules; loc^{2-3} is very closely linked (0·53%) with cl_2^{Wh}. As an alternative to the hypothesis put forward by Stephens (cf. *PBA*, XXII, Abst. 1586), the authors suggest that the inheritance of the cluster and short-branch mutants in the amphidiploid species may be interpreted on the basis of two nonduplicate complementary loci, one occurring in genome A and the other in D.

4177 Ariyanayagam, D. V. & Wijewantha, R. T.
The progress of recent breeding work on cotton in Ceylon.
Trop. Agriculturist 1956 : **112** : 251–61.
Selection of medium-staple Upland varieties at the Hambantota Cotton Research Station is described. Selection S6–06 from 5143 Cambodia is to be released under the designation HC101. It is superior in yield and fibre and spinning properties to BP79, the cotton exclusively grown in Ceylon at present. Hybridization between parents from different countries has been undertaken.

4178 **Activities and achievements of the Pakistan Central Cotton Committee.**
Pakist. Cott. 1956 : **1** : 7–12.
The work of the Pakistan Central Cotton Committee is briefly reviewed. Breeding for improved yield and quality, particularly longer staple and higher ginning percentage, is in progress in Multan, Montgomery and Hyderabad. Mention is made of promising strains developed during the period since partition.

4179 Ansari, M. A. A. & Baluch, M. A.
Our cotton collections.
Pakist. Cott. 1956 : **1** : 24–35.
The material in the collection of the Pakistan Central Cotton Committee, at Mirpurkhas, includes 487 strains of *Gossypium hirsutum*, 40 of *G. barbadense*, 42 of *G. arboreum*, one colchicine-doubled cross between *G. arboreum* and *G. stocksii* and five wild species, namely *G. thurberi*, *G. klotzchianum* var. *davidsonii*, *G. raimondii*, *G. sturtii* and *G. anomalum*. Data are provided on the yield of seed cotton as compared with M4, the halo length and the ginning percentage of a number of the more promising selections.

4180 Moosberg, C. A.
Cotton breeding with special emphasis on coarseness and maturity.
Bull. Ark. agric. Exp. Sta. 1956 : No. 581 : Pp. 54.
Detailed descriptions are included of populations of eight crosses involving a Nucala x Rowden line and six other crosses, made with a view to developing storm-proof lines combining coarseness, maturity and strength of fibre. Tabulated data are provided on the results of trials of these new strains at several localities in Arkansas and on their spinning performance. Yarn of high quality was produced by NR–AHA52–2, from a cross between Nucala x Rowden and Acala x Hopi x Acala, and the fibre of [R(2)–Emp] 21 [(Roldo Rowden Improved 27 x Empire WR) F_1 x Roldo Rowden Improved 27] was outstanding in cleanability, dyability, reduction in picker waste, low nep content, reduction of ends down and strength of cloth. Advanced testing of strains from the combinations (Rowden – Empire) – Rowden, (Nucala – Rowden) – Rowden – Rowden and (Coker 100W – Bacterial Blight Resistant) – Coker 100W indicated that a comparatively high level of production had been established.

4181 **Wild strain holds key to cleaner cotton harvest.**
What's New Crops Soils 1957 : **9** : No. 7 : p. 30.
An experimental cotton hybrid has been developed in Mississippi from crosses between a wild, glabrous line and commercial strains. The new hybrid combines the smooth-leafed character of the wild strain with desirable agronomic qualities from the commercial varieties.

4182 Kammacher, P.
Les possibilités actuelles d'application de l'hybridation interspécifique à l'amélioration du cotonnier en milieu africain. (**The present possibilities of applying interspecific hybridization to the improvement of cotton under African conditions**).
Cot. et Fibr. trop. 1956 : **11** : 101–36.
The following topics are reviewed: taxonomic relations of *Gossypium* species, their genomic constitution, the genetic nature of specific differentiation in *Gossypium* and interspecific hybridization.

4183 Weaver, J. B. (Jun.)
Embryological studies following interspecific crosses in *Gossypium*. I. *G. hirsutum* x *G. arboreum*.
Amer. J. Bot. 1957 : **44** : 209–14.
In the cross *G. hirsutum* x *G. arboreum*, the hybrid endosperm and maternal tissue developed only when the egg cell was not fertilized or the zygote failed to divide, large ovules without embryos being produced. With double fertilization, endosperm development ceased about 6 days after pollination followed by embryo starvation. Production by the hybrid embryo of a substance detrimental to endosperm growth is regarded as the probable cause of abortion. Vigorous hybrids were raised with the aid of mixed pollination and embryo culture; lethal genes could not therefore have been responsible for embryo failure.

4184 Chow [Chou], K.-Y.
(Preliminary tests on the intergeneric cross between *Gossypium* and *Hibiscus*—a conspicuous increase in the length of the lint).
Nung-yeh-hsueh Pao/Act. agric. sinica 1956 : **7** : 89–92. [Chinese].
Offspring derived asexually from pollinating cotton with *H. rosa-sinensis* for two years in succession had yellow petals, increased vigour and lint 1·5 in. long.

4185 Glavinič [Glavinić], R.
(Vegetative hybridization between cotton species with different chromosome sets).
Agrobiologija (Agrobiology) 1956 : No. 5 : 77–82. [Russian].
Heritable changes were observed in Belgrade in the seed progenies of $\frac{\textit{Gossypium barbadense}}{\textit{G. herbaceum}}$ and of $\frac{\textit{G. arboreum}}{\textit{G. hirsutum}}$. The plants had intermediate or new morphological characteristics and had different chromosome numbers from the components of the grafts. In the case of the first mentioned hybrid, $2n = 26$–34, in the second, $2n = 38$–46.

4186 Bouillenne-Walrand, M. & Sironval, C.
L'action du 2-4 D sur la morphologie, l'anatomie et la descendance de *Gossypium herbaceum.* **(The action of 2,4-D on the morphology, anatomy and progeny of *G. herbaceum*).**
Bull. Soc. roy. Bot. Belg. 1953 (1954) : **86** : 227–36; and Arch. Inst. Bot., Liège 1954–1955 (1956) : **23**.
Abnormalities were noted in the first few leaves of F_1 offspring of plants treated with 2,4-D.

4187 ***Digvijay* cotton.**
Indian Fmg. 1957 : **7** : No. 1 : p. 17.
A new cotton variety for Middle Gujarat, Digvijay (Vijay x 1027ALF), gives higher yields than Vijay and possesses superior fibre.

4188 Sarvella, P. A.
Multivalent formation and genetic segregation in some allopolyploid *Gossypium* hybrids with observations on cytomixis.
Diss. Abstr. 1956 : **16** : Publ. No. 18,005 : 2005–06.
Multivalent frequencies in tetraploid and hexaploid allopolyploids were determined. The various numbers of multivalents possible were used to calculate expected segregation ratios, assuming that bivalents are the result of homogenetic pairing and multivalents separate at random. The two sets of values were related in a linear fashion. Known averages for multivalent frequencies and segregation ratios were then plotted against the line obtained. In most cases deviations between expected and actual values were explicable on the basis of random variation.
Some abnormalities attributed to cytomixis are described (cf. Abst. 3214).

4189 Rodičev, S. D.
(Recover the lost millimetres).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 4 : 5–8. [Russian].
This survey of Soviet cotton varieties mentions a reduction in length of fibre observed in 108F and the fine-fibred variety 2IZ in recent years and also decreases in the ginning percentage of these and a few other varieties. The slow rate of introduction of new varieties is criticized. Substitution of varieties in some districts by others which have improved quality of fibre or are more productive and breeding of new varieties for long fibre are advocated.

4190 Nanjundayya, C.
Technological reports on standard Indian cottons, 1955.
Technol. Bull. Indian Cott. Comm. : Ser. A : 1956 : No. 90 : Pp. 106.
The bulletin provides a report of tests on the fibre properties and spinning performance of samples of 21 varieties chosen as standards from the 1954–55 crop (cf. *PBA*, XXVI, Abst. 1473).

4191 **Summary of fiber and processing test results on some varieties of cotton grown by selected cotton improvement groups, crop of 1956.**
Agric. Mktg. Serv. Agric. Inform. Bull. 1957 : No. 170 : Pp. 82.
The results of tests on the principal commercial varieties constituting the 1956 crop in the USA are summarized along the lines of previous reports (cf. *PBA*, XXVI, Abst. 3526).

4192 Gentry, H. S.
A new *Gossypium* from Michoacan, Mexico.
Madroño, S. Francisco 1956 : **13** : 261–65.
The new species is related to *G. aridum* from which it differs, in particular, in its large deeply-lobed calyx.

4193 Gondola, I.
Csírázásnak indult gyapotmagvak hidegkezelésének hatásvizsgálata 1950-ben. (**A study of the influence of cold treatment on germinated cotton seed in 1950**).
Agrártud. Egy. agron. Kar. Kiad. 1954 : **1** : No. 7 : Pp. 37.

In studies carried out at the Hungarian Agricultural Academy, exposure of air-dried seeds to 0° C. for 168–216 hr. stimulated growth while exposure for 72 hr. or more than 216 hr. retarded development. It is suggested that selection for resistance to cold may be effected by selecting those plants which are least affected by treatments resulting in retardation.

4194 Gondola, I.
Hidegkezeléses kísérletek gyapottal. (**Experiments on cold treatment of cotton**).
Agrártud. Egy. agron. Kar. Kiad. 1955 : **2** : No. 4 : Pp. 26.

At the Hungarian Horticultural Research Institute, in continuation of earlier studies (cf. Abst. 4193) air-dried seeds exposed to —1° C. for (*a*) 168 or (*b*) 360 hr. gave rise to plants which flowered at a lower node than the controls. Flowering time and ripening period of the (*a*) plants were similar to those of the control, while the (*b*) plants showed marked retardation. Boll weight was increased by cold treatment. On the basis of these results, the selection of plants showing the greatest vigour under cold treatment is recommended together with directed training over several generations to induce flowering at a lower node.

4195 Naumović, B.
Rezultati proučavanja otpornosti pamuka prema poznim prolećnim mrazevima i korišćenje ove osobine u selekciji. (**The results of studying cotton resistance to late spring frosts and the use of this characteristic in selection**).
Arh. poljopr. Nauk. 1956 : **9** : No. 25 : 79–94.

Lines 942 and 944 were selected for resistance to spring frost from variety-population 182 at Zaječar. They ripen earlier than 182, outyield this by 65% and produce fibre of good quality. A method of testing the cold resistance of breeding material under laboratory conditions was developed; the young plants of the above selections showed improved resistance as compared with such varieties as 182, Egyptian, Giza and Empire.

4196 Verderevskiĭ, D. & Voĭtovič, K.
(**A method for developing gummosis-resistant cotton varieties**).
Hlopkovodstvo (Cott.-raising) 1957 : No. 5 : 37–38. [Russian].

Healthy plants selected in Moldavia among the varieties 611B, OD1, 3521U and 6466U which had been artificially infected with *Xanthomonas malvacearum* gave an F_1 characterized by a high degree of resistance. The respective percentages of immune F_1 plants for the above varieties were 96·5, 93·6, 90·0 and 92·3%.

4197 Méndez R, E. D.
Selecciones de algodón Tangüis y nematodes: campaña 1955–56. (**Selections of Tangüis cotton and nematodes: season 1955-56**).
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 355 : 10–15. (Mimeographed).

The selections resistant to *Verticillium* wilt were less affected by root diseases than susceptible lines. Not enough is known yet about the biology of the nematode to enable direct selection to be carried out for resistance to it.

4198 Doucet, M., Soos, L., Doucet, V., Ştefan, I. & Tătaru, V.
Contribuţii la ameliorarea inului pentru fibre. (**Contributions to the improvement of fibre flax**).
Bul. şti. : Secţ. Biol. Şti. agric. 1956 : **8** : 643–56.

Three promising lines have been bred in Rumania by hybridization followed by training in an arid environment. The best is 10/50 (Concurrent x Ri.B.19/17), which surpasses Concurrent in yield of stems, fibre and seed. The other lines are 6/49 (Suruceni 12/41 x Crésus) and 23/50 (Mureş 39/41 x Concurrent).

4199 Antropov, A. M.
(**For flax fibre with higher rating**).
Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 4 : 8–11. [Russian].

Mention is made of two new flax varieties, T5 bred at Tomsk and L1120 at Smolensk. The former is rated highly for its fine quality of fibre. L1120 shows resistance to lodging and fungi and is productive of seed and fibre, but the extraction rate of fibre and the quality of fibre are lower than those of Svetoč, 806/3 and 1288/12.

4200 Durrant, A.
Effect of parental environment on offspring character in flax.
Heredity 1957 : **11** : p. 153. (Abst.)
The seed from plants of Stormont Cirrus which had been treated with all eight combinations of N, P and K at the Dept. of Agricultural Botany, Aberystwyth, varied in weight but germinated evenly the following year The progeny were grown in all 16 combinations of N, P, K and Ca and large and significant differences in weight of the above-ground parts at maturity were noted between plants whose parents had received different treatments. These differences appear to persist into the following generation. Small but significant interactions occurred between parental and offspring treatments.

4201 Hillmann, H. D.
Standfestigkeitsprüfungen an etiolierten Keimpflanzen von Lein. (**Tests of standing capacity on etiolated seedlings of flax**).
Züchter 1957 : **27** : 145–49.
By growing the seedlings in pots in the dark and then placing them in the open, varietal differences in standing capacity could be demonstrated and measured. Similar differences could be detected indoors by the use of a current of air produced by a vacuum cleaner or other suitable device. The varieties with the highest standing capacity were Wiera and Diana among the fibre varieties and Endress' Deutscher Öllein [Endress German Linseed] among the linseeds.

4202 Crescini, F.
Intorno alla selezione della canapa da tiglio coltivata in Italia. (**On the selection of fibre hemp cultivated in Italy**).
Sementi elette 1957 : **3** : No. 3 : 10–16.
The method described is that summarized in Abst. **3761**.

4203 Barbieri, R.
Contributo al miglioramento genetico della canapa. (**Contribution to the genetic improvement of hemp**).
Sementi elette 1957 : **3** : No. 1 : 22–33.
After reviewing previous work carried out in Italy on this subject (cf. *PBA*, XXV, Abst. **3253**) the author gives a progress report of his own work in Campania. Mass selection on the basis of plant height, maturity and disease resistance has given good results in the improvement of the variety Eletta campana [Selected Campania] and single plant selection has also been carried out on the basis of fibre content and other characters. German varieties obtained from the Max Planck Institute have proved very variable under Italian conditions, especially in respect of height. Several selected lines and groups have shown progressive adaptation to Italian conditions but so far all are inferior to Eletta campana.
The study of monecious plants has continued and it has been found that the percentage of monecious plants decreased in the second year after both selfing and open pollination. The F_1 progeny from a cross between a monecious variety and Eletta campana were all diecious. The vegetative cycle of the monecious varieties was short but their time of maturity was variable, making harvesting difficult.

4204 Cheuvart, C.
Expériences sur le développement de *Cannabis sativa* L. (sexualité et pigments foliaires) à température constante et sous différents régimes de photopériodisme. [**Experiments on the development of *C. sativa* L. (sexuality and leaf pigments) at constant temperature and under different photoperiodic treatments**].
Bull. Acad. Belg. Cl. Sci. 1954 : **40** : 1152–68.
In hemp plants grown at constant temperature in a phytotron, flowering occurred more rapidly under 8-hour than under 16-hour photoperiods. Short-day treatment also caused male plants to become hermaphrodite. Flowering was associated with a decrease in the content of chlorophyll, especially of chlorophyll a, in leaves at the flowering nodes and at the immediately preceding node. It is suggested that this decrease results from an increase in the hydrolytic activity of chlorophyllase and that the phytol thus released plays an important role in flowering.

4205 Vorobjev, A. M.
(**Agricultural evaluation of monecious hemp**).
Lën i Konoplja (Flax & Hemp) 1957 : No. 4 : 23–25. [Russian].
A monecious variety from the Fibre-Plants Institute was a fortnight earlier and more productive of seed than the standard JuS1 at the Gluhov Varietal Field Station. It was suitable for combine harvesting.

4206 Crescini, F., Della Mano, A. & Bellini, P.
Sul miglioramento genetico della canapa da tiglio coltivata in Italia. (**On the genetic improvement of fibre hemp grown in Italy**).
Caryologia 1957 : **9** : 215–25.
Correlations have been found at Carmagnola, Italy, between the fibre content of a segment of the stem 70 cm. long, measured from the mid point downwards at the beginning of anthesis, and the fibre content of whole stems at maturity in plants of *Cannabis sativa* var. *hypocotyle-viridi*. For male plants the correlation was $r = +0{\cdot}677$ and for female plants $r = +0{\cdot}791$. (Cf. *PBA*, XXV, Abst. 3253).

4207 Kuwada, H.
(**On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. XVI. Artificial media for pollen germination**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **7** : 186–89. [Japanese].
The germination of the pollen of *Hibiscus* (*Abelmoschus*) *esculentus*, *H. manihot* and their amphidiploid was investigated on glucose agar and on media to which growth hormones or tissue extracts had been added. In general the pollen of *H. esculentus* germinated better than that of *H. manihot*; the latter germinated best in the presence of style extracts. The behaviour of the amphidiploid pollen on the various media was comparable to that of *H. esculentus* though the germination percentage was lower on some media. (Cf. Abst. 2647).

4208 Kuwada, H.
(**On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. XVII. The effect of a change in temperature on the germination of the seed**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **7** : 190–92. [Japanese].
The plants studied were *Hibiscus* (*Abelmoschus*) *esculentus*, *H. manihot* and their amphidiploid. The seeds of each were subjected to abnormally high (40 to 80° C.) or abnormally low (—10 to 3° C.) temperatures for 0·5–24 hr. and then transferred to suitable temperature conditions for germination. The parental species whose germination was the more adversely affected by the pretreatments was *H. manihot*. The behaviour of the amphidiploid was intermediate between that of the parents.

4209 Kimura, A.
Symbolae iteologicae. XIV. (**Contributions on willows. XIV**).
Sci. Rep. Inst. Res. Inst. Tohoku Univ. 1957 : **23** : 7–16.
A description of a new form, *Salix woodii* f. *amblyolepis*, from South Africa is included.

4210 Kimura, A.
Symbolae iteologicae. XV. (**Contributions on willows. XV**).
Sci. Rep. Inst. Res. Inst. Tohoku Univ. 1957 : **23** : 17–20.
A new Japanese form of the hybrid *Salix* x *ikenoana* is described and designated f. *subcordata*.

SUGAR AND STARCH PLANTS

4211 **Twelfth Annual Report of the Indian Central Sugarcane Committee 1955-56** (1957) : Pp. 140.
Canes used as parents at Coimbatore included Co.677, Co.775, Co.798, Co.840, Co.945, CP29/291, Q50 and F31–436.
In some of the fourth back-cross seedlings of (*Saccharum officinarum* x *S. spontaneum*) x *S. spontaneum*, all the chromosomes of *S. officinarum* had been eliminated while others contained 3–5 univalents from this species (cf. Abst. 730). Cytological study of hybrids from (BC_3 Vellai x *Sclerostachya*) x *Sorghum durra* is expected to throw light on the part played by *Sorghum* in the evolution of *Saccharum*. Cytogenetical investigations are in progress to elucidate the relationship between *S. officinarum* and *S. robustum*. Forms of *S. spontaneum* were collected in the Middle East, Africa and south-east Asia. The world collection has been established at Taliparamba to avoid loss due to mosaic at Coimbatore. Many varieties which normally do not arrow at Coimbatore do so at Taliparamba. Pollen fertility and seed setting have also been good in the new locality.
Varietal tests of resistance to *Ustilago scitaminea* and *Colletotrichum falcatum* continued at Coimbatore and elsewhere.
The results of field and milling trials of Co. canes in the different states are reported.

4212 Raghavan, T. S.
Sugar-cane breeding in India.
World Crops 1957 : **9** : 242–46.
The author gives a popular account of the

general cytogenetical behaviour of the sugar cane and of breeding in India.

4213 Jayasekera, E. W. H.
Techniques of seed and seedling production with sugar cane.
Trop. Agriculturist 1956 : **112** : 262–66.

Investigations carried out at Polonnaruwa to develop techniques for breeding are outlined. Aspects dealt with are choice of matings, times of opening of the florets and anther dehiscence, crossing methods, fuzz storage, germination and seed selection. Nobilization has been carried out, using *Saccharum spontaneum* and *S. robustum* as nonrecurrent parents. The Indian method of using a potting mixture to root the stalks of ♂ parents has been successfully applied.

Annual Report of the Mauritius Sugar Industry Research Institute, 1956 : Pp. 92.

4214 *Sornay, A. de. Cane breeding in 1956. (pp. 21–30).*

Study of the effect of altitude upon male fertility in several varieties continued (cf. *PBA*, XXVI, Abst. 3547). B34104 and Ebène 1/37 were outstanding as either ♀ or ♂ parents on the basis of the number of seedlings produced. M147/44 proved to be a highly prolific ♂ parent. An appendix lists the numerous crosses involving these and other varieties. Crosses were made in order to discover whether selfed males yield more valuable progeny than nonselfed canes of the same variety. In pre-release trials, M129/43, M147/44 and M31/45 were superior in some respects to the standard M134/32 (cf. *loc. cit.*). Cold storage of fuzz at 8°–10° C., after drying at 35° C. for 5–6 hr., has resulted in greatly improved germination.

4215 Toledo, F. F. de
Espécies e variedades de cana de açúcar. **(Species and varieties of sugar cane).**
Solo, Piracicaba 1956 : **48** : Nos. 2–3–4 : 43–52.

An outline is given of the systematics of the genus *Saccharum*, the methods of producing new varieties by hybridization and the cytology and genetics of the seedlings. In Brazil the most successful seedlings so far have been those combining the species *S. officinarum*, *S. spontaneum* and *S. barberi* in their parentage; the Brazilian CB canes of this type are now beginning to supersede the Co. canes.

4216 Segalla, A. L. & Alvarez, R.
Ensaios de variedades de cana de açúcar. I—Série de ensaios realizados no período de 1951 a 1954. **(Tests of sugar-cane varieties. I. A series of regional tests carried out in the period 1951-54).**
Bragantia 1956 : **15** : 373–92.

Some of the varieties most promising in other respects have been rejected on account of susceptibility to smut. The best of the canes not affected by smut were Co.290, Co.419 and CB36/14.

4217 Bieske, G. C.
Varietal trials—1956 season.
Cane Gr. quart. Bull. 1957 : **20** : 117–29.
Are new varieties superior to old ?
Ibid. 1957 : **20** : p. 139.

The first article summarizes the results of yield trials at experiment stations and on estates in Queensland. The second draws attention to two trials which demonstrated the superiority of modern canes over older varieties even in the absence of ratoon-stunting disease.

4218 Arruda, H. C. de
Variedades de cana para o estado de São Paulo. **(Sugar-cane varieties for the state of São Paulo).**
Solo, Piracicaba 1956 : **48** : Nos. 2–3–4 : 39–40.

Varieties suitable for cultivation by sugar factories and by planters in Brazil and others suitable for the production of alcohol are enumerated. Several Brazilian canes of the CB series are recommended for replacing Co. canes.

4219 Barrie, A. G.
Varietal differences in post-harvest cane deterioration.
Proc. Qd. Soc. Sug. Tech. 1957 : 133–40.

Considerable varietal differences were found in post-harvest rates of deterioration as shown by reduction in sugar content and loss in cane weight. Breeding of varieties resistant to such deterioration is considered feasible.

4220 Hughes, C. G.
New Guinea once more in the news.
Cane Gr. quart. Bull. 1957 : **20** : 130–31.

The plans of the sugar-cane expedition now exploring New Guinea are outlined. It is hoped to collect material from areas not hitherto visited for this purpose. (Cf. Abst. 3267).

4221 Chang, H.
Spring paddy sugarcane in Taiwan.
Taiwan Sug. 1957 : **4** : No. 4 : 17–24.

The best cane to interplant with the spring rice crop is H37–1933.

4222 Bergeret, P. W. & Fernández Paolillo, W.
Estudio de diversas variedades de sorgo azucarado y sus posibilidades alcoholígenas. (**Study of different varieties of sweet sorghum and their alcohol-yielding properties**).
Rev. Asoc. Ing. agron., Montevideo 1956 : **25** : No. 99 : 17–36.

Information is presented on the yields per ha. of grain, stems, starch, sucrose, reducing sugars and alcohol obtained from 18 varieties from the USA tested in Uruguay in 1955–56. The crop is regarded as promising for the production of alcohol, the total alcohol produced per ha. being up to three times that obtained from maize.

4223 Geidel, H. & Höppner, H.
Zur Unterscheidung von Zuckerrübensorten auf Grund sortentypischer Merkmale am Blatt. (**The differentiation of sugar-beet varieties on the basis of varietal characters of the leaf**).
Zucker, Hannover 1957 : **10** : 98–99.

It is claimed that it should be possible to characterize varieties by means of discriminant functions based on a number of measurements of leaf dimensions.

4224 Sedlmayr, K.
Aktuelle Probleme der Zuckerrübenzüchtung. (**Present problems of sugar-beet breeding**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 24 : Pp. 18.

The text of this contribution is substantially the same as that referred to in Abst. 4231. In some closing remarks the speaker also referred to the successful use of inbred lines in the production of his hybrids resistant to *Cercospora*, as for instance Beta Y–19, derived from *Beta maritima* crosses. The importance of physiological studies for further progress in breeding is emphasized, it being pointed out that selection for lower K content can lead to higher sugar contents; disease resistance, the production of hybrid seed and monogerm varieties are other lines of progress illustrated.

4225 Campbell, G. K. G.
Sugar beet breeding, some aims and possibilities.
Brit. Sug. Beet Rev. 1957 : **25** : 155–61.

A popular discussion is given of breeding sugar beet for production in the United Kingdom, with reference to such topics as bolting, single-germ seed, tolerance of virus yellows, eelworm resistance, juice quality and polyploids.

4226 Thompson, E. G.
Trials of commercial strains of sugar beet.
Brit. Sug. Beet Rev. 1957 : **25** : 151–53.

A short survey is given of the main results of the trials conducted in 1954–56 by the National Institute of Agricultural Botany, England.

4227 Barbacki, S., Bilski, E. & Rosnowski, S.
Wyniki doświadczeń z odmianami buraków cukrowych wykonanych w latach 1947–1951. (**Results of trials of sugar-beet varieties carried out in the years 1947-1951**).
Roczn. Nauk rol. : Ser. D : 1956 : **73** : Pp. 133.

Results are reported of tests involving 20 varieties, conducted at numerous localities in Poland. Tonnage varieties responded better to high soil fertility than high-sugar types. Normal-type varieties did well throughout the country while high-sugar types gave their highest yield under the more continental conditions of the south-eastern region. Detailed information is provided on the yield, sugar content, leaf production, resistance to *Cercospora beticola*, bolting percentage and commercial value of five normal-type, four tonnage and five high-sugar varieties.

4228 Wauthy, R. & Roussel, N.
Les résultats des essais comparatifs de variétés de betterave sucrière en Belgique de 1952 à 1956. (**The results of comparative trials of sugar-beet varieties in Belgium from 1952 to 1956**).
Publ. Inst. belge Amélior. Better. 1956 : **24** : 153–65.

The trials were conducted at three locations. Data are provided on germination, root yield, sugar percentage, yield of sugar per ha. and yield of tops.

4229 Savitsky, V. F.
Inheritance of chlorophyll deficiencies in *Beta vulgaris* L.
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 321–36.

The author amalgamates the results of investigations carried out by himself and other workers with some new data. Chimeric plants with variegated leaves were usually proved to be due to heritable cytoplasmic changes. The effects of the following genes for chlorophyll deficiencies are described in detail: w_1 for albinism; *Au* for the *aurea* condition; *lu* causing the *lutescens* type; vi_1, vi_2 and vi_3 for *virescens* mutants; and ch_1 and ch_2 for the *chlorina* condition. Interactions between certain genes for chlorophyll deficiencies and effects of the environment upon chlorophyll formation in plants homozygous or heterozygous for genes causing deficiencies are noted. Variation in the intensity of green colour in commercial populations is under polygenic control.

4230 Gerdes, G.
Problematik und Methodik des Hauptzuchtzieles in der Zuckerrübenzüchtung: Höchster Zucker- und Futterertrag von der Flächeneinheit. (**Problems and methods in the main objective of sugar-beet breeding: maximum sugar and fodder yield per unit area**).
Zucker, Hannover 1957 : **10** : 3–11.

In a general survey it is pointed out that insufficient attention has been given to combining ability to make full use of the heterosis effect in sugar-beet breeding; by rather indiscriminate crossing of mixed populations an increase in sugar yield of some 5% has been achieved in the tonnage and almost 7% in the normal types. An examination of the literature shows views to be divided on such questions as the degree of inbreeding desirable and the degree to which combining ability can be judged by yielding capacity, by top crosses say with red garden beet or by other indirect methods. Heterosis in diploid beets leads mainly to an increase in yield; the production of triploid beets leads to increased sugar contents and a longer growing period, which, when combined with bolting resistance, also means higher yielding ability; various methods of testing and selecting for bolting resistance are discussed and the advantages to be gained from forms capable of germinating at relatively low soil temperatures are expounded. The winter beets capable of being sown in autumn or early spring, though not suitable for most parts of central Europe, may be of interest for certain areas with favourable climatic conditions.

4231 Sedlmayr, K.
Rekurrente Selektion auf reciproke Kombinationsfähigkeit. Ein Beitrag zur Züchtung polyploider Heterosispopulationen bei *Beta vulgaris*. (**Recurrent selection for reciprocal combining ability. A contribution to the breeding of polyploid heterotic populations in *B. vulgaris***).
Züchter 1957 : **27** : 65–69.

The triploid beets obtained by crossing tetraploid x diploid have exceeded both parents in vigour, drought resistance, sugar content and purity of juice, the ash and noxious N contents being lower; they are also almost completely monogerm and the seed yield is equal to that of the diploids. A method of selection is described which tends to increase the proportion of triploids: the two parent lines are sown together and allowed to interpollinate; only those progenies in which the majority of plants were hybrids are selected, the assumption being that some sort of selective fertilization is responsible for the high proportion; on the basis of yield tests the mother plants that give the greatest degree of heterosis for yield are then selected, this being calculated according to the formula

$$h_2 = \frac{100\,H\% - h_1 \times n}{n_2}$$

where $H\%$ is the yield of the entire progeny expressed as a percentage of that of the standard varieties, h_1 and h_2 are the yields of the hybrids and the nonhybrids respectively and n and n_2 their proportions. The mother plants are reproduced clonally and the best clones are planted together and also subjected to a test cross with the reciprocal clonal population. The further course of the procedure is described as follows: "the seed yields of clone populations Ax and By are planted as the starting point for further selection, while the test cross (AB, BA and AB + BA) is tested for the success of the selection in comparative tests".

4232 Sedljmaĭr [Sedlmayr], K. & Belocerkovskaja, L. A. (Translator)
(**The role of polyploidy in breeding sugar beet**).
Agrobiologija (Agrobiology) 1956 : No. 5 : 102–07. [Russian].

The development of triploid strains with improved sugar content, low percentage of bolters

and higher root and leaf yields than most diploid varieties at Sopronhorpács, Hungary, is described. The method consisted of open-pollinating the colchicine-induced tetraploids Beta C 242/53 and K 720 with diploid varieties such as Beta E 111. In recent trials in Hungary and other countries the triploids Beta 1 and Beta 3 outyielded all other varieties.

4233 Aldrovandi, A.
La bietola poliploide. (**Polyploid beet**).
Sementi elette 1957 : **3** : No. 2 : 14–21.

The techniques used in the development of polyploid sugar beet by means of colchicine treatment and the characteristics of the triploid and tetraploid plants thus produced are described and future prospects discussed. Polyploid seed derived from *Cercospora*-resistant material is being distributed in Italy during 1957.

4234 Kloen, D.
La création de betteraves polyploïdes. (**The production of polyploid beets**).
Netherlands J. agric. Sci. 1957 : **5** : 86–103.

In this popular article, information already abstracted in *PBA*, XXIV, Absts. 2293–4, XXV, Abst. 434 and XXVII, Abst. 3277 is summarized. In addition, methods of producing commercial triploid seed are discussed. Among crosses between tetraploid sugar beets and tetraploid mangels, the cross Sy (derived from Kleinwanzlebener E) x VC (from Alpha) has done well. Crosses of Sy with the diploids Friso, Alpha and Eureka have given some good triploid material.

4235 Meier, W.
Ergebnisse der Sortenprüfung bei Zuckerrüben 1954–1956. (**Results of varietal testing with sugar beets in 1954-56**).
Mitt. schweiz. Landw. 1957 : **5** : 92–94.

The Swedish varieties Hilleshög Polyploid and Hilleshög K gave significantly higher root yields than Kleinwanzleben Polybeta and other varieties tested in Switzerland but owing to its higher sugar content Polybeta produced the same yield of sugar.

4236 Kökény, B.
Particolari caratteristiche del seme di barbabietole poliploidi. (**Particular characteristics of the seed of polyploid sugar beet**).
Sementi elette 1957 : **3** : No. 3 : 28–31.

The commercial value of polyploid sugar-beet strains is discussed with reference to their greater root and sugar yields and their tendency to produce larger seed-balls containing fewer seeds. It is pointed out that these larger seed-balls show a lower germinating capacity and methods of overcoming this disadvantage by seed treatment are briefly reviewed.

4237 Okanenko, A. S.
(**Utilizing the physiological and biochemical properties of different beet forms for improving the sugar content of sugar beet**).
Agrobiologija (Agrobiology) 1956 : No. 5 : 3–14. [Russian].

Physiological and biochemical properties of sugar beet, mangel, beetroot, the sexual hybrids of sugar beet x mangel, sugar beet x chard and the vegetative hybrids of F_1 beetroot x sugar beet/sugar beet, F_1 mangel x sugar beet/sugar beet, F_1 mangel x sugar beet/mangel, chard/mangel and sugar beet/beetroot were investigated at Kiev and the results are discussed in relation to breeding sugar beet for high sugar content. It is thought that the following methods should be used for developing new varieties with a high sugar content: (1) selection of large-rooted forms among high-sugar types, (2) crossing tonnage types with high-sugar types or chard and (3) vegetative hybridization involving chard or wild species such as *Beta corolliflora*.

4238 Beysel, D.
Osmotischer Wert und Viskosität des Protoplasmas diploider und polyploider Zuckerrüben. (**Osmotic value and viscosity of the protoplasm of diploid and polyploid sugar beets**).
Ber. dtsch. bot. Ges. 1957 : **70** : 109–20.

In determinations made on the epidermal cells of the leaves of young $2x$, $3x$ and $4x$ plants during damp weather, osmotic values decreased with successively higher degrees of polyploidy, while viscosity was highest in the triploid, lowest in the tetraploid and intermediate in the diploid. In the diploid normal sugar beet type Klein Wanzleben N the viscosity value was lower than in Klein Wanzleben E, a high-yielding diploid type with lower sugar content. Viscosity rose with increasing soil dryness, the greatest increase being observed in the tetraploids and Klein Wanzleben N and the least in the triploids and Klein Wanzleben E. A period of soil dampness following the dry period resulted in a reduction

in viscosity in young leaves, especially in the tetraploid plants.

4239 Bartl, K., Curth, P., Fischer, H. E. & Schneider, H.
Untersuchungen über die Keimfähigkeit von polyploidem Zuckerrübensaatgut. **(Investigations on the germinating capacity of polyploid sugar-beet seed).**
Zucker, Hannover 1957 : **10** : 142–47, 163–78.

A comparison of the seed-balls of Kleinwanzleben N polyploid beet with those of the normal diploid showed them to have a large number of seed chambers without seeds or with seeds that failed to germinate. The number of seed chambers per 100 seed-balls was consistently lower in the polyploids than in the diploids. Though in general the percentage of seed chambers with germinating seeds was lower in the polyploids, certain polyploid lines were found in which it was equal to the diploids and it is concluded that the germinating capacity of the polyploids can be improved by selection.
No significant differences between polyploids and diploids were detected in ease of segmentation. Germination in tetraploids could be improved by treatment with H_2SO_4 and there was some indication that water in which poorly germinating tetraploid seeds had been soaked contained some substance which exerted a depressing influence upon germination when applied to other seeds.
Seeds excised from seed chambers that had failed to burst normally were occasionally induced to germinate, in which case they gave rise to apparently normal plants, with euploid chromosome numbers; reduced germinating capacity cannot therefore be ascribed exclusively to meiotic disturbances leading to aneuploidy.

4240 Kato, K. & Ohkubo [Okubo], K.
(On bolting during seed production in sugar beet).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1957 : No. 72 : 41–47. [Japanese].

Six morphological categories of bolting are distinguished. The type of bolting depends both on environmental conditions and on the genotype. An association was noted between bolting category A (one main stalk) and tonnage-type sugar beets and between category B (several stalks) and high-sugar beets.

4241 Margara, J. & Touvin, H.
Stérilité male et sélection de la betterave sucrière. **(Male sterility and breeding of the sugar beet).**
CR Acad. Agric. Fr. 1957 : **43** : 237–40.

Work on the detection of cytoplasmic male-sterile sugar-beet lines by testing against *Nxxzz* pollinators at the Versailles plant breeding station is described. A number of lines with cytoplasmic male sterility have been obtained but a wide range in degree of male sterility was observed, only some lines being 100% male sterile.

4242 Gačinskiĭ, E.
(Monogerm sugar beet).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1957 : No. 3 : 42–43. [Russian].

Belocerkovskaja Odnosemjannaja [Monogerm Belaja Cerkovj] and other monogerm varieties have recently been developed in the Ukraine. The former equalled the multigerm standard L1789 in root and sugar yield.

4243 Brewbaker, H. E. & Bush, H. L.
Performance of successive generations of two sugar beet varieties.
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 285–88.

Successive mass increases have been made without selection during the past 20 years or more as a general practice in producing seed of varieties developed by the Great Western Sugar Co., USA. From previous reports and data given in this paper, it is concluded that sugar content and purity have remained constant through several generations of increase. The frequency of bolters has shown a definite, although not pronounced, rise in a number of increase lots. Some instances of reduction in yielding ability as the result of possible genetic changes have been encountered but were usually small. Varieties maintained in this manner have therefore not suffered any serious deterioration.

4244 Žďárský, J.
Příspěvek ke zjištění variability cukrovky. **(Considerations on the determination of sugar beet variability).**
Listy cukr. 1957 : **73** : 126–28.

In order to estimate yield and the possibilities of mechanization, a statistical study has been made of variability in the height of the tops, the effects of singling and the performance of the singled plants.

4245 Zaharčenko, A. I.
(The development of sugar-beet varieties resistant to *Botrytis* rot).
Agrobiologija (Agrobiology) 1956 : No. 6 : 67–72. [Russian].
An account of breeding varieties combining high root and sugar yields with improved resistance to *Botrytis* at Vernjačka is presented. Mention is made of new selections which are superior to the standard R632 in all these respects.

4246 Schlösser, A.
Cercopoly—ein Fortschritt in der *Cercospora*-Resistenzzüchtung. **(Cercopoly, a step forward in breeding for *Cercospora* resistance).**
Zucker, Hannover 1957 : **10** : 35–38.
Figures are given showing that the Kleinwanzleben CR beets, bred for resistance to *C. beticola* from crosses with resistant wild beets, are now almost equal to the N and E forms in root conformation and bolting resistance; in sugar content and juice purity they are superior but in yield still somewhat inferior when no *Cercospora* is present. The polyploid *Cercospora*-resistant lines known as Cercopoly give very much higher root yields and their sugar yield per ha. in Italy has amounted to 76–77 c. compared with 63–66 for the diploids. They have given correspondingly good results when tested in infected areas in Switzerland, Turkey and Bavaria, and under conditions free from *Cercospora* have given sugar yields equal to those of the N strains.

4247 Koch, F., Göttemann, E. & Vetter, A.
Vierjährige Sorten-Spritzversuche mit Zuckerrüben im niederbayerischen *Cercospora*-Befallsgebiet. **(Four-years spraying tests with sugar-beet varieties in the area of Lower Bavaria subject to *Cercospora* attack).**
Zucker, Hannover 1957 : **10** : 121–28.
Observations on six varieties with and without spraying with Cupravit showed that under natural conditions of infection the average yield of Polybeta was greater than that of the resistant diploid strains Kleinwanzleben CR and Buszczynski CLR even without spraying; thus though these two varieties were higher in sugar content and lower in noxious nitrogen, their cultivation would be advantageous only under conditions of very severe infection. In the sprayed plots the differences in yield were considerably greater, Polybeta giving 29% more root yield and 28% more sugar yield than the resistant strain CR.

4248 Dufournet, R. & Goarin, P.
Note sur la culture du manioc à Madagascar. **(Note on the cultivation of cassava in Madagascar).**
Riz et Rizic. 1957 : **3** : 15–38.
Descriptions are given of some of the more important varieties grown locally and of six hybrid clones. The breeding programme for this crop is also briefly outlined.

4249 Mason, R. R.
Cassava varieties in Fiji.
Agric. J. Fiji 1956 : **27** : 88–93.
Descriptions of 16 varieties and the results of trials of these varieties in the wet and intermediate zones are given.

STIMULANTS

4250 Mann, T. J. & Chaplin, J. F.
The effect of the mammoth gene on certain quantitatively inherited characters of flue-cured tobacco.
Agron. J. 1957 : **49** : 230–33.
Short-day back-cross selections carrying the "mammoth" gene (cf. *PBA*, XX, Abst. 1809) had in general fewer suckers, more leaves, higher yields of cured leaf, higher values per acre and lower values per cwt. than the day-neutral recurrent parental varieties. In the back-cross selections of Dixie Bright 101 and 102, increase in yield was however attained without loss in quality as measured by value per cwt. and distribution of grades.

4251 Krishnamoorthy, K. V. & Bhat, N. R.
An amphidiploid *Nicotiana glutinosa* L. x *Nicotiana trigonophylla* Dun. hybrid.
Curr. Sci. 1957 : **26** : p. 120.
A fertile amphidiploid ($2n = 48$) of the above combination has been obtained by treating the F_1 with colchicine. The characters of *N. glutinosa* predominated in both the F_1 and amphidiploid, the size of the plant parts being slightly increased in the latter.

4252 Izard, C.
Obtention et fixation de lignées tumorales et non tumorales à partir de mutations expérimentales de l'hybride *N. glauca* x *N. langsdorffii*. **(Production and fixation of lines with and without tumours from experimental mutations of the hybrid *N. glauca* x *N. langsdorffii*).**
CR Acad. Agric. Fr. 1957 : **43** : 325–27.
The amphidiploid of the above cross produces

tumours. From seeds subjected to X irradiation, mutant lines have been isolated (1) devoid of tumours and (2) with tumours mainly confined to the roots.

4253 Schipfer, L.
Ergebnisse einiger im Jahre 1956 angestellter Versuche. (**Results of some experiments carried out in 1956**).
Tabakpfl. Öst. 1957 : **8** : 9–14.
The report includes an account of manurial and variety tests with tobacco in different parts of Austria. Among the dark tobaccos Olympia proved outstanding; Scheich was some three weeks earlier than Burley Giuseppina and Big exceeded this latter variety in yield, disease resistance and quality as a filler tobacco.

4254 ***Bidi* tobacco.**
Indian Fmg. 1957 : **7** : p. 17.
A new tobacco variety, S–20–2, developed by the Agricultural Research Station, Nipani, Mysore State is of superior quality to the local bidi tobacco and in addition gives higher yields.

4255 Gubenko, F. P.
(**The question of agroecological variability of tobacco**).
Tabak (Tobacco) 1957 : No. 1 : 55–58. [Russian].
The variability of different provenance types of Dubec 44, Trebizond 93, Samsun 27 and Havana 1936 with regard to thickness of leaf blade, weight of dried leaf per unit area and hygrometric values of the leaf tissues has been investigated.

4256 Lumang, H., Reyes, R. S. & Apon, C.
Preliminary study of the fire-holding capacity of tobacco leaves of different varieties and types.
Philipp. J. Agric. 1955 (1957) : **20** : 35–42.
The results of investigations on the fire-holding capacity of varieties of the Virginia, White Burley, wrapper, cigar-filler and Turkish types are reported.

4257 Madamba, U. V. & Sison, B.
A comparative test of five varieties of wrapper tobacco at Kidapawan Wrapper Tobacco Experiment Station, Cotabato, Mindanao.
Philipp. J. Agric. 1955 (1957) : **20** : 21–32.
Baker Sumatra was the best as producer of wrapper leaves, followed by Ax Hybrid (Florida Sumatra x Baker Sumatra).

4258 Egri, L.
Untersuchung über die Alkaloide einiger Tabaksorten mit besonderer Berüksichtigung der Erforschung der Biosynthese von Nornikotin. (**Investigations on the alkaloids of some tobacco varieties with special reference to the study of the biosynthesis of nornicotine**).
Fachl. Mitt. öst. Tabakregie 1957 : No. 1 : 19–24.
Material of the tobacco variety Djebel of different provenance was found on careful analysis to contain varying amounts of nornicotine in addition to nicotine in the leaves; the variety Muskutal, previously classed as containing only nornicotine, was found to contain also various oxidation or dehydrogenation products of nicotine. It was further demonstrated that nicotine can be converted into nornicotine in leaves exposed to air and that this conversion is inhibited by HCN, which suspends the activity of the oxidizing enzymes. Varieties that contain principally nornicotine had a higher polyphenoloxidase activity than varieties that contain mainly nicotine. The actual proportions of the two alkaloids found in any given variety varied with environmental conditions and with the developmental stage of the plant.

4259 Noda, A.
(**Studies on the tolerance of tobacco to waterlogging. I.**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **7** : 176–79. [Japanese].
Varietal differences in the extent to which a series of mainly American varieties were damaged by waterlogged soil are noted.

4260 Bennett, C. W.
Interactions of sugar-beet curly top virus and an unusual mutant.
Virology 1957 : **3** : 322–42.
A virus producing marked vein yellowing was found in a Turkish tobacco plant which had recovered from curly top at Salinas, Calif. Designated "yellow-vein virus" it was found to have the same host range as curly-top virus except that it did not persist in *Nicotiana glauca*. It is transmitted by *Circulifer tenellus*, four species of *Cuscuta* and by grafting and its presence results in a marked decrease in the curly-top component in tobacco, plants infected with both viruses showing symptoms of only moderate severity. Plants which have recovered from curly top are immune to yellow-vein virus

transmitted by *C. tenellus* and resistant to transmission by grafting. It is concluded that the yellow-vein virus is a mutant strain of the curly-top virus.

4261 Tomo, N., Fuchinoue, Y. & Fuchinoue, H.
(Studies on the preservation of tea pollen).
Chagyo Kenkyu Hokoku/Tea. Res. J. 1956 : No. 8 : 2–8. [Japanese].

The optimum storage conditions were 5–7° C. at a relative humidity of 60%. Pollen remained viable under these conditions for more than 31 days. Varietal differences in viability after storage were not apparent under optimum storage conditions but were conspicuous under inferior storage conditions.

4262 Ueno, K., Hara, T. & Motomura, A.
(Studies on the improvement of Imperial grade green tea for export. I. Investigations of the properties of pan-fired teas made from different varieties).
Chagyo Kenkyu Hokoku/Tea Res. J. 1956 : No. 8 : 52–62. [Japanese].

The suitability of 29 Japanese varieties for manufacture of tea of the type mentioned above was investigated. Variety differences were most conspicuous in respect of colour of the dried leaf, colour of the liquor and content of tannin and total nitrogen. High quality is associated with high content of tannin and total nitrogen. The varieties giving best-quality teas are listed.

4263 Nakabayashi, T., Washiyama, H. & Ishida, F.
(Studies on pectin in tea. III. The relation between the quality of green tea and pectin content).
Chagyo Kenkyu Hokoku/Tea Res. J. 1956 : No. 8 : 86–89. [Japanese].

The pectin content and pectin number [soluble pectin/(total pectin)^2] of a series of Japanese varieties were determined. Pectin number and tea quality are positively correlated.

4264 **Annual Report of the Tea Research Institute of Ceylon for the year 1955.**
Bull. 1956 : No. 37 : Pp. 69.

Clone 2024 maintained its high yielding capacity (cf. *PBA*, XXVI, Abst. 1584). The calculated mean yields of blister-blight resistant clones in their first three-year cycle of plucking ranged from 2042 lb. (Ken/16/3) to 1342 lb. per acre (B8). Selection for resistance to eelworm received attention.

4265 Fraga Jr., C. G. & Conagin, A.
Delineamentos e análises de experimentos com cafeeiros. **(Designs and analysis of experiments with coffee).**
Bragantia 1956 : **15** : 177–91.

Descriptions are given of the manuring and variety tests with coffee carried out at the agronomic research institute at Campinas, Brazil; certain defects in the designs have been overcome by the analysis of covariance. It has been shown that progenies grown in the shade display less reliable differences than when grown in the sun. There has been a tendency in latter years to increase the number of replications in progeny tests.

4266 Silva, H. L. e
Número de cromossomos em *Coffea racemosa* Lour. **(Chromosome number in *C. racemosa* Lour.).**
Bragantia 1956 : **15** : xvii–xviii.

Root-tip counts of *C. racemosa* from Moçambique showed it to have $2n = 22$.

4267 Reis, A. J. & Arruda, H. V. de
Frutificação no cafeeiro. **(Fruit setting in coffee).**
Bragantia 1956 : **15** : 93–98.

Data are presented which show that the set of fruits was significantly increased by P, K and farm-yard manure but the total yield was not correlated with the fruit set.

4268 Howard, G. A.
Evaluation of hops. V. The essential oil of hops.
J. Inst. Brew. 1957 : **63** : 126–38.

This article includes a table showing the composition of the oils extracted from 13 varieties of hops examined at the Brewing Industry Research Foundation, England.

4269 Howard, G. A. & Tatchell, A. R.
Evaluation of hops. VI. Influence of variety on the composition of the α- and β-acids.
J. Inst. Brew. 1957 : **63** : 138–42.

Evidence is presented to show that the proportions of cohumulone in the α-acid and colupulone in the β-acid are varietal characters and remain relatively unaffected by environmental factors. Details are given of the content of these substances in over 50 varieties and of the percentage of cohumulone in 12 F_1 progenies of BB1.

MINOR CROP PLANTS

4270 Bor, N. L.
The genus *Cymbopogon* Spreng in India, Burma and Ceylon.
J. Bombay nat. Hist. Soc. 1953 : **51** : 890–916; and 1954 : **52** : 149–83.

After discussing the characteristics of the above genus, some of the former work carried out on the genus and the taxonomic problems presented by pairs of superficially similar species and by hybrids the author provides a key to the 26 species and a detailed description of them. Information on oil production and the chemical composition of the oils is included. The chromosome numbers so far reported are: *C. caesius* and *C. nardus*, $2n = 20$; *C. flexuosus*, $2n = 20$ and 40; *C. coloratus* and *C. martinii* $2n = 40$; and *C. atratus*, $2n = 40$ and 60.

4271 Hazina, E. P.
(New varieties of sweet pepper obtained by vegetative hybridization).
Agrobiologija (Agrobiology) 1956 : No. 6 : 47–54. [Russian].

A report on graft hybridization at Odessa involving two *Capsicum* varieties differing in morphology and the flavour of the fruit, together with descriptions of changes observed in the seed progeny of the scion, is presented. Among the forms selected in the F_5 were 8/51 Konusovidnyĭ [8/51 Conical] and 11/51 Hobotovidnyĭ [11/51 Proboscidiform]; both have large fleshy fruits and their flavour is good, fresh or canned. The new varieties outyielded the standards Novočerkassk and D211 and surpassed these and all other varieties in resistance to *Fusarium*. Analyses of the fruit of the new varieties showed that they had higher sugar, dry matter and vitamin C contents than commonly grown sweet pepper varieties.

4272 El Chile. Indicaciones generales para su cultivo. **(Red pepper. General indications for its cultivation).**
Foll. Divulg. Secretaría Agric. Ganad., Méx. 1957 : No. 23 : Pp. 26.

Both sweet and pungent forms are grown in Mexico and the characteristics of the varieties grown are described and illustrated, with instructions for their cultivation.

4273 Hirose, T., Ukita, S. & Takashima, S.
(The characters of red-pepper varieties).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 8 : 44–50. [Japanese].

A series of 57 Japanese and American varieties is classified into 10 variety groups, some further subdivided, on the basis of such characteristics as the dimensions of the cotyledons, leaves and fruits and pigmentation of the fruits.

4274 Rai, U. K. & Jacob, K. T.
Induced mutation studies in *Sesamum* and mustard.
Sci. & Cult. 1956 : **22** : 344–46.

After a general survey of the use of X-irradiation in the production of induced mutations in crop plants the authors report briefly on their own results, obtained at the Bose Institute, Calcutta, with *Brassica juncea* and *Sesamum*. In both cases mutants were obtained which produced more seeds and consequently gave an increased yield of oil. A white-flowered mutant of *B. juncea* which was isolated from the X_2 progeny gave a larger number of fruits in the X_3 from which oil with a lower peroxide value was obtained. White-flowered and small-seeded mutants of *Sesamum* were found in the X_3 and X_4 generations respectively and both were found to give a higher percentage of oil than non-irradiated controls.

4275 Persson, B.
Korsbefruktningens betydelse och omfattning hos raps (*Brassica Napus* L.) speciellt med avseende på binas insats. [**The significance and extent of cross pollination in rape (*B. Napus* L.) with special reference to the role of honey-bees**].
Medd. Växtskyddsanst. Stockh. 1956 : No. 70 : Pp. 36.

In studies of both summer and winter rape, cross pollination with pollen from long stamens gave longer siliquas, more seeds per siliqua and greater total seed weight than crossing with pollen from short stamens, selfing with pollen from long or short stamens or open pollination. Experiments with bee-proof cages indicated that numbers of bees per m.^{2} had little effect on the amount of cross pollination occurring. Pollen from long and short stamens did not differ in rate of germination in 10% sucrose solution. The addition of a pistil from a young flower to the sucrose solution retarded the growth of foreign pollen but appeared to accelerate that of self pollen, suggesting that in young flowers self rather than cross pollination is favoured.

4276 **Castorbeans are ready.**
Agric. Res., Wash. 1957 : **5** : No. 9 : p. 12.

The development by the Texas Agricultural Experiment Station of a dwarf variety of castor

oil plant giving high yields is reported. It is resistant to shattering and is therefore suitable for machine harvesting and is not subject to damage by high winds.

4277 Zimmerman, L. H.
The relationship of a dwarf-internode gene to several important agronomic characters in castorbeans.
Agron. J. 1957 : **49** : 251–54.

The feature of dwarf internodes in US172 is monogenic and recessive to normal length of internode, and inherited independently of number of nodes to the first raceme, total number of nodes, capsule dehiscence and the pistillate or monecious condition (cf. *PBA*, XXVI, Abst. 1058). The value of the gene for dwarf internodes in breeding varieties suitable for mechanical harvesting is discussed.

4278 Jackson, R. C.
The hybrid origin of *Helianthus doronicoides*.
Rhodora 1956 : **58** : 97–100.

Artificial hybridization experiments indicate that the above epithet applies to a hybrid between *H. mollis* and *H. giganteus*.

4279 Žданov, L. A. & Alekseev, A. P.
(Vegetative hybridization of the sunflower).
Agrobiologija (Agrobiology) 1956 : No. 5 : 45–54. [Russian].

The use of vegetative hybridization at the Don Breeding Station for development of early, short-stemmed varieties productive of seed and oil and resistant to *Orobanche* is discussed and supported by tabulated evidence.

4280 Habura, E.-C.
Parasterilität bei Sonnenblumen. (**Self and cross sterility in sunflowers**).
Z. Pflanzenz. 1957 : **37** : 280–98.

Preliminary experiments showed that although self pollination could give sets of up to 70·2% it was always less effective than cross pollination and was therefore classed as illegitimate. When different flowers of the same head were pollinated the set was 5% higher than when the flowers were selfed.

In crossing experiments varied degrees of compatibility and the existence of a number of compatibility groups were revealed. It was therefore necessary to assume the operation of at least two gene pairs, with sporophytic control of incompatibility. The frequent occurrence of reciprocal differences indicated that the effect of the respective genes in pollen and style may differ. There were indications that one of the two gene pairs showed complete dominance and the other an intermediate effect, with a certain degree of competition or mutual weakening. Attention is called to the relative elasticity of such a system in natural conditions.

4281 Šanin, Ĭ.
(New sunflower varieties).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1957 : No. 2 : 16–17. [Bulgarian].

Variety 75 bred at the Dobrudža Agricultural Institute outyields 3–18 and shows resistance to *Orobanche*. Variety 85 from Sofia is early and shows resistance to drought and *Homeosoma nebulella*. It is productive in districts free from *Orobanche* and has a good kernel-husk ratio and an oil content of 30·56%.

4282 Hartley, C. W. S.
Oil palm breeding and selection in Nigeria.
J. W. Afr. Inst. Oil Palm Res. 1957 : **2** : 108–15.

An evaluation of the improvement attained in bunch yield and fruit composition by early selection for the purpose of seed production precedes an account of inheritance studies now in progress and of present policies of selection and seed production. Inheritance of fruit type is being investigated in (1) crosses and selfings involving a wide range of *dura* and *tenera* material, (2) crosses of extreme types of *dura* with *pisifera* palms and (3) crosses of *pisifera* parents with standard *dura* palms. Inheritance of fruit colour is also receiving attention (cf. Abst. 4285).

4283 Broekmans, A. F. M.
The production of improved oil palm seed in Nigeria.
J. W. Afr. Inst. Oil Palm Res. 1957 : **2** : 116–32.

The methods and results of past and current selection of palms for controlled pollination for seed purposes are surveyed in detail.

4284 Broekmans, A. F. M.
Studies of factors influencing the success of controlled pollination of the oil palm.
J. W. Afr. Inst. Oil Palm Res. 1957 : **2** : 133–41.

Investigations carried out at the West African Institute for Oil Palm Research, Nigeria, indicated that with pollination of each inflorescence on three consecutive days the full receptive period is likely to be covered (cf. *PBA*, XXIV, Abst. 558). The optimum moisture content of

pollen for storage was about 11%. Storage in a refrigerator at 5° C. with a relative humidity of 25–30% gave the most successful results. The limit of viability for satisfactory fruit set was 10%. This percentage is normally reached with the standard method of storage over calcium chloride after about 6–8 weeks.

4285 PURVIS, C.
The colour of oil palm fruits.
J. W. Afr. Inst. Oil Palm Res. 1957 : **2** : 142–47.

The results of a determination of the colorimetric values and carotene content of the oils of fruits belonging to subtypes of the *nigrescens* and *virescens* types are reported in full (cf. Abst. 3367). *Rubro-nigrescens* fruits and those of the corresponding *virescens* subtype possess about four times as much pigment as fruits of *rutilo-nigrescens* trees and the corresponding *nigrescens* subtype. The former group also has a higher content of carotene. Investigation of the inheritance of fruit colour is under way.

4286 D'AMATO, F.
Revisione citosistematica del genere *Colchicum.* II: Nuove località di *C. autumnale* L., *C. lusitanum* Brot. e *C. neapolitanum* Ten. e delimitazione dell' areale delle tre specie nella penisola italiana. (**Cytosystematic revision of the genus *Colchicum.* II: New localities for *C. autumnale* L., *C. lusitanum* Brot. and *C. neapolitanum* Ten. and the delimitation of the area of the three species in the Italian peninsula**).
Caryologia 1957 : **9** : 315–39.

The chromosome numbers of the species listed above have been determined as $2n = 38$, $2n = 106$ and $2n = 140$, respectively, in all Italian material studied. A map is provided showing the distribution of the three species in the Italian peninsula. (Cf. *PBA*, XXVI, Abst. 58).

4287 SCHWANITZ, F.
Spornbildung bei einem Bastard zwischen drei *Digitalis*-Arten. (**Spur formation in a hybrid between three *Digitalis* species**).
Biol. Zbl. 1957 : **76** : 226–31.

In a hybrid population ($2n = 84$) obtained from a cross between the amphidiploid *D. ambigua* x *D. lanata* ♀ ($2n = 112$) and *D. purpurea* ♂ ($2n = 56$), one plant in which spurred flowers regularly occurred and two in which they appeared occasionally were found. It is suggested that the different species contain complementary factors for spur formation.

4288 SCHWANITZ, F.
Zur Genetik der Blütenfärbung bei *Digitalis purpurea.* (**The genetics of flower colour in *D. purpurea***).
Züchter 1957 : **27** : p. 150.

Hybrids of *D. purpurea* with *D. lanata* and with an amphidiploid *D. ambigua* x *D. lanata* all had red flowers, regardless of whether the *D. purpurea* parent had red or white flowers. From this it is concluded that *D. lanata* contains the gene *P*, which together with *C* combines in *D. purpurea* to produce red flowers. White-flowered hybrids could presumably be produced by crossing a form of *D. purpurea* having the constitution *cc*.

4289 **RRIM'600' series clones.**
RRI Plant. Bull. 1957 : No. 30 : 41–50.

The performance of the rubber clones RRIM 600–630 in trials at the Sungei Buloh station and on estates in Malaya is reviewed. Descriptive notes are given on the promising clones RRIM 600 (Tjir 1 x PB86), 603 (PB86 x Pil B84), 605 (Tjir 1 x PB49), 607 (Tjir 1 x PB49), 610 (RRIM504 x Tjir 1), 612 (AVROS157 x PB49), 613 (Tjir 1 x RRIM509), 614 (Tjir 1 x RRIM509) and 615 (RRIM511 x Tjir 1).

4290 TAN HONG TONG
Een beschouwing over heveazaailingenselectie bij het Algemeen Proefstation der A.V.R.O.S. (**A survey of *Hevea* seedling selection at the General Experimental Station of the General Association of Rubber Planters of the East Coast of Sumatra**).
Bergcultures 1957 : **26** : 211–33.

In view of the advantages of seedling material compared with clonal plantings, including (*a*) the greater possibilities of improvement offered by crossing suitable parents, (*b*) the more vigorous growth of seedlings, allowing earlier tapping, and (*c*) evidence that seedlings are less liable to wind damage and bark diseases, more widespread use of seedlings in Indonesia is advocated. A crossing scheme involving tested parent clones, untested high-yielding clones and untested clones giving good yields and having additional desirable characters is outlined and information on suitable parents and on the establishment and arrangement of seed gardens and trial grounds for the rapid production of seedling material is provided.

4291 ***Dothidella*-resistant Hevea clones.**
Commonw. Phytopath. News 1957 : **3** : 19, 21.

A note is given on the Brazilian *Dothidella*-resistant clones now established at the Rubber

Research Institute of Malaya as a precautionary measure should South American leaf blight appear in the Far East (cf. *PBA*, XXVI, Abst. 3660).

4292 **Brief Reports of the Rubber Research Institute of Malaya 1953** (1954) : Pp. 3; **1954** (1955) : Pp. 11; **1955** : Pp. 10; and **1956** (1957) : Pp. 15. (Mimeographed).

Production of legitimate seedlings and clonal trials continued. It is hoped that commencement of the project to transfer the resistance of Brazilian introductions to Malayan clones will shortly be feasible (cf. *PBA*, XXVI, Abst. 3660). The possibility of forecasting the yield of untested clones by latex-vessel counts, calculation of sieve-tube size, preliminary testing and determination of rubber content in leaf portions is being explored.

FRUITS AND NUTS

Report of the 14th International Horticultural Congress held at The Hague-Scheveningen, Netherlands, 29 August-6 September, 1955. 1-2 : Pp. lxxix + 1647.

The papers abstracted below are of most direct interest to breeders of fruits and vegetables. The proceedings also include the Report of the International Committee on Horticultural Nomenclature and Registration.

4293 *Cullinan, F. P. Current trends in horticultural research in the United States.* (*pp. 1–13*).

Among the topics touched upon in this general lecture are the intensified programme of introduction, the production of hybrid onions and spinach and the large-scale attempt to induce useful mutations by nuclear radiation.

4294 *Walker, J. C. Breeding for disease resistance.* (*pp. 51–63*).

A discussion is given of breeding for resistance to *Fusarium* wilts, *Phytophthora infestans* and other fungal diseases in vegetables, with the emphasis laid upon the relative merits of monogenic and multigenic resistance, mutability of the pathogen, and the importance of detailed information on the relation of environmental influences to the expression of resistance and to the type and range of variability of the pathogen in devising rapid and reliable methods of screening large populations.

4295 *Harland, S. C. Gene centres and the search for resistant breeding material.* (*pp. 64–70*).

In considering the general potentialities of finding sources of disease resistance in main and subsidiary centres of diversity of cultivated crops and their wild relatives, the author envisages three types of genetic systems governing resistance. The first consists of a major gene, the second of a key gene which by itself has a relatively weak expression but is capable of being enhanced by modifiers, while the third type of resistance is polygenic. These modes of control are respectively designated the dictator, democratic and anarchic systems. The relative proportions of the three types of resistance will depend upon ecological screening, mutual biotic screening between host and pathogen, and the breeding system. Apart from preadaptational resistance in the form of dictator genes and hidden recessives, desired sources of resistance are more likely to be found in subsidiary centres of diversity than in primitive ones, where fewer and possibly less important diseases and pests may be expected to occur. Breeders should as far as possible aim at an optimum concentration of genes belonging to the three systems. It is finally suggested that screening procedures devised by pathologists may be too drastic, favouring only dictator genes.

4296 *s'Jacob, J. C. Testing methods for breeding for disease resistance.* (*pp. 71–81*).

The principal requirements which methods of infection and the inoculum must satisfy in order to obtain reliable results in vegetable breeding are specified. Comments are made upon the value and procedures of testing by artificial infection in the glasshouse and by artificial and natural infection in the field, and upon problems of the organization of testing. The author draws largely upon experience in the Netherlands.

4297 *Fuchs, W. H. Züchtung auf Trocken- und Salzresistenz.* (*Breeding for resistance to drought and salinity*). (*pp. 413–27*).

In a general discussion of the problem it is pointed out that a capacity to develop an efficient root system even under conditions of drought is a hereditary feature which can be selected in parents and progenies; a capacity to limit the leaf number or area is also an advantage. Stomatal reaction is a more reliable criterion of drought resistance than osmotic pressure or transpiration rate. Attempts to estimate cytoplasmic resistance indirectly have also proved only limited in applicability, and

even its direct determination can be effected only after suitable hardening and in relation to the developmental phase during which drought is incident for a given plant in a given area.
Attention is called to the insufficiency of present knowledge both as to the component factors which constitute drought resistance and as to their mode of inheritance. Indications are given of the most promising way of procedure in a breeding programme, in default of this full knowledge; this would comprise the study of a large number of initial crosses, particularly those involving parents of differing ecological types, followed by selection for resistance only in the later generations, to give time for recombination of genes and possible transgressive segregation. The final test of resistance will, with the present state of our knowledge, have to be done under natural conditions of drought in the field.
Breeding for resistance to salinity is limited more still by lack of knowledge of the nature of resistance and for this objective, as for drought resistance, considerable achievements are predicted as soon as the necessary knowledge has been attained.

4298 *Glavinić, R. L'hybridation végétative comme méthode dans la sélection des tomates. (Vegetative hybridization as a method of breeding tomatoes). (pp. 440–45).*
The variety Trophée d'or [Gold Trophy], with pinnate leaves, grafted on to Kartofelisni [Potato-leaved], gave seeds from which 52 plants were obtained; these varied in fruit colour and form and in leaf form. One of the plants selected gave rise to a form which yielded up to 3300 g. of fruits per plant and ripened at the same time as Kartofelisni.
Grafts of Dwarf Champion tomato on *Solanum nigrum* bore fruits changed in form and flavour and some of the plants of the first seed generation were distinguished by drought resistance and ripened 14 days earlier than Dwarf Champion; in later generations they became earlier and in the fourth some plants ripened 18 days before Dwarf Champion. One of the hybrids was resistant to frost as well as drought.

4299 *Rudorf, W. The transfer of resistance to bean mosaics from* Phaseolus coccineus *to fertile hybrids obtained from* Ph. vulgaris *x* Ph. coccineus. *(pp. 446–51).*
In investigations at the Max Planck Institute for Breeding Research, Germany, Bo.19 and Great Northern UI15 and UI123 showed the r_1 type of reaction to virus 1; no symptoms were developed after rubbing or grafting and no virus could be recovered. The r_1 reaction of *Ph. coccineus* 'Weisse Riesen [White Giant] and 'Rote Prunk [Red Splendour] to virus 2 was incorporated in a limited number of plants obtained from crosses with *Ph. vulgaris*.

4300 *Walkof, C. An application of the double backcross breeding method to tomato improvement. (pp. 452–59).*
The author discusses investigations referred to in *PBA*, XXVI, Abst. 764 and XXVII, Abst. 276.

4301 *Miller, J. C. Some technic used in the breeding of vegetable crops in the United States. (pp. 460–67).*
Limited to cabbage, potato and sweet potato, an account is given of already published work on induction of flowering by such means as adjustment of the photoperiod and temperature, girdling, grafting and spraying with 2,4-D. Attention is also drawn to the value of pollen banks for both local and international use by breeders.

4302 *Nishi, S. The commercial seed production of F_1 varieties of vegetables in Japan. (pp. 468–78).*
The economic status of F_1 seed production of tomatoes, egg plant, cucumber and water melon and the causes of the success of F_1 seed in Japan are analysed. Commercial methods of seed production and their efficiency are described and fundamental research relevant to simplification of procedures of F_1-seed production of various vegetables is surveyed. Problems requiring attention if the F_1-seed industry is to be extended in old and new crops are indicated.

4303 *Haine, K. E. The improvement and maintenance of varieties of winter cauliflower. (pp. 479–83).*
In order to ensure continuation of a uniform and reliable stock for seed of winter cauliflower grown in south-western England, genotypes shown by progeny tests to be the most valuable for inclusion in the strain are maintained by means of cuttings obtained from the inflorescences according to the method described in an earlier paper (cf. *PBA*, XXII, Abst. 1500).

4304 *Konvička, O. Beitrag zur Technik der Beschleunigung der Kohlzüchtung* (Brassica oleracea *v.* capitata). [*Contribution to the technique of accelerating the breeding of cabbage* (B. oleracea *v.* capitata)]. *(pp. 585–91).*
The breeding method described comprises the making of an imprint of the vertical section of the head on cyclostyle paper, on which all data

relating to the plant in question are recorded; those heads which after sorting the data are deemed most desirable are then planted for seed production (cf. *PBA*, XXIII, Abst. 9316). Details are given of the characteristics of four improved varieties bred in Czechoslovakia.

4305 *Bauer, R. Resistenzprobleme in der Gattung* Ribes *L. und Möglichkeiten ihrer züchterischen Lösung durch intra- und intersektionelle Kombination.* (*Resistance problems in the genus* Ribes *L. and possibilities of solving them by breeding within and between sections*). (*pp. 685–96*).

A certain degree of resistance to *Sphaerotheca mors-uvi* has been found in *R. divaricatum, R. niveum, R. cynosbati* and *R. pinetorum* and by crossing *R. grossularia* with *R. divaricata*, followed by back crossing, some promising resistant forms have been produced, some of which are also resistant to *Pseudopeziza ribis, Mycosphaerella ribis* and *Cronartium ribicola*; their berries are as large as those of the gooseberry Weisse Voltragende [White Prolific]. Three of them have been released under the names Resistenta, Perle von Müncheberg [Müncheberg Pearl] and Robustenta. A great number of other promising mildew-resistant seedlings are under observation.

Progeny of *R. americanum, R. aureum, R. sanguineum* and particularly *R. dikuscha* contained a number of seedlings resistant to *Ps. ribis*; seedlings of crosses of *R. dikuscha* with black currant have been obtained which are resistant to all the races occurring at Voldagsen, Germany, and two of them are also rust resistant; in back crosses with black currant 75% of the seedlings remained free from *Ps. ribis* and 2% relatively free from rust. Most seedlings were hardier than the cultivated black-currant varieties but most of them were still inferior in flavour and self fertility and require further back crossing. In crosses of *R. nigrum* with species in other sections such as *R. irriguum, R. succirubrum* and *R. grossularia* a greater degree of fertility was observed in the seedlings when the black currant served as the seed parent but these seedlings were mostly parthenogenetic. All seedlings of Schwarze Traube [Black Grape] x Lady Delamere were thornless. When the gooseberry parent was chosen from among the new mildew resisters, up to 10% of the hybrids were resistant to *S. mors-uvi*; all were frost hardy and attack by *Ps. ribis* and rust was slight.

Over 80% of true hybrids were obtained in crosses between black and red currants, the cross Heros x Goliath being specially promising; many of the seedlings displayed marked heterosis and three of these combined resistance to *S. ribis, Ps. ribis* and *C. ribicola*; all were hardier than the black-currant parent.

A number of amphidiploids of red x black currant and other intersectional hybrids have been produced by treatment with 1% colchicine and most of them breed true on selfing.

4306 *Nilsson, F Amphidiploid species in the genus* Ribes. (*pp. 697–711*).

Completely fertile amphidiploids ($2n = 32$) of *R. nigrum* x *R. grossularia, R. nigrum* x *R. niveum* and *R. sativum* x *R. nigrum* have been produced at the Horticultural Research Station, Alnarp, Sweden, by colchicine treatment of the sterile F_1 hybrids. They have been respectively designated *R. nigrolaria, R. nigroveum* and *R. satigrum*. The fruits of *R. nigrolaria* vary in size but are larger than those *R. nigrum*, the average weight of 100 being 244 g. The number of flowers per raceme is 1·7. The berries are almost glabrous, dark red to black and liable to crack. Compared with *R. nigrolaria, R. nigroveum* is more vigorous and more resistant to American mildew, with smaller bluish-black fruits which are more attractive in appearance and more acid The average number of flowers per raceme is 3·0. *R. satigrum* bears large, dark red berries, the number of flowers per raceme being 10·3. Preliminary study of meiosis has shown chromosome pairing to be regular. Crosses between the amphidiploids have given positive results.

4307 *Rietsema, I. Hybrides interspécifiques des genres* Ribes *et* Rubus. (*Interspecific hybrids of the genera* Ribes *and* Rubus). (*pp. 712–15*).

A hybrid of *Ribes multiflorum* x *R. sativum* was crossed with *R. rubrum* and gave rise to several seedlings, one of which was selected as a new variety of red currant and named Rondom; it is resistant to late spring frosts, two weeks later than the common red currant, yields well and is easy to pick, the bunches having retained the habit of *R. multiflorum*.

A black gooseberry has been produced by crossing *R. divaricatum* with the black currant Goliath and the reciprocal; it has been named Brinio.

A fertile tetraploid hybrid was obtained from *R. grossularia* x *R. nigrum*. From *R. bracteosum* x *R. nigrum* 'Goliath' a single sterile hybrid was produced. A number of other crosses that were attempted without success are enumerated.

Rubus idaeus has been crossed successfully with a number of other species though all the hybrids had reduced fertility except *R. idaeus* x *R. occidentalis*. Improvements can be attained by back crossing but a number of characters of different species that tend to persist are mentioned; these include various adverse features of the fruit. Heterosis often persists in later generations, up to the sixth. No resistance to witches' broom has been found in any of the hybrids.

4308 *Zwintzscher, M. Über die Reaktion von Sorten der Steinobstarten* Prunus cerasus *und* Prunus avium *auf die Infektion mit* Monilinia. (*The reaction of varieties of the stone-fruit species* P. cerasus *and* P. avium *to infection with* Monilinia) (*pp. 716–24*).

A collection of 29 sour and 5 sweet cherries together with a number of seedlings were tested by artificial infection with strain M–4. Some of the varieties showed a low degree of fungal infection of the bark but a high degree of gummosis. The same was true of selfed seedlings of the Schattenmorelle [Morello cherry] and F_1 seedlings of this with other cherries; only one plant remained free from infection in two successive years.

Similar differences were observed in the degree of infection of the sweet cherries, though they showed a lower tendency towards fungal infection and more towards gummosis.

No difference in the reactions was observed when the tests were repeated with inoculum obtained from other sources.

4309 *Shay, J. R., Dayton, D. F., Hough, L. F., Williams, E. B. & Janick, J. Apple scab resistance.* (*pp. 725–39*).

Breeding for resistance to *Venturia inaequalis*, using species such as *Malus floribunda* and *M. pumila*, is described (cf. *PBA*, XXVI, Abst. 645). Three races of the fungus have been distinguished (cf. *PBA*, XXVI, Abst. 3692).

4310 *Bishop, C. J. The production of bud sports in apples through the use of artificial radiation.* (*pp. 740–45*).

Irradiation of Cortland with X rays or thermal neutrons resulted in sectorial changes in fruit colour (cf. *PBA*, XXIV, Abst. 3275). It is however suggested that sectorial sports may be selected so as to increase the size of the red sectors and eventually obtain completely red sports. Thermal neutrons are considered to be more effective than X rays for inducing mutation in apple (cf. *PBA*, XXVI, Abst. 640).

4311 *Braak, J. P. Effects of some internal and external factors on the embryo and seedling development of the cherry.* (*pp. 845–52*).

Investigations at the Institute of Horticultural Plant Breeding, Wageningen, Netherlands, have revealed a similar relationship between viability and ripening period among European varieties to that reported by Tukey for American cherries, early varieties undergoing little or no germination when stratified and sown in the usual way. By embryo culture better germination of early varieties and hybrids may be secured. The breeding cycle may also be reduced since excised embryos germinate without after-ripening and the juvenile period may thus be curtailed by one year. The author describes experiments on the effects of such factors as the nutrient solution, substrate and age of the embryo upon the success of the technique. Long-day treatment of the seedlings obtained by embryo culture leads to a considerable reduction in abnormal growth.

4312 *Maurer, E. Arbeiten und Erfahrungen mit* Malus baccata *und* Malus prunifolia *beziehentlich deren Art-Bastarden zur Gewinnung vegetativ vermehrbarer und frostresistenter Unterlagen.* (*Work and experience with* M. baccata *and* M. prunifolia *or their interspecific hybrids for obtaining vegetatively reproducible and frost-resistant rootstocks*). (*pp. 853–55*).

In a collection of some 600,000 seedlings about 6000 showed good rooting capacity but 95% of them had to be discarded on account of low compatibility with the varieties to be used as scions; 136 clones were selected for their compatibility and frost resistance and later selection has narrowed them down to 12, differing in vigour. Others are promising as stem builders.

4313 *Karnatz, H. Über die Eignung der generativen Nachkommenschaften einiger Kernobst-Kultursorten für die Unterlagenverwendung in Deutschland.* (*The suitability of the seedling progenies of some cultivated varieties of pome fruits for use as rootstocks in Germany*). (*pp. 875–78*).

Open-pollinated seedlings from nine apple and eleven pear varieties were examined for vigour, disease and frost resistance and uniformity. The hardiest apple seedlings were those from *Malus prunifolia* var. *sikora*, Grahams Jubiläum [Graham's Jubilee] and Hadelner Jakobsapfel; among the pears the hardiest were from Kirchensaller Mostbirne [Kirchensall perry pear].

4314 *Haas, P. G. de. Neue Beiträge zur Sämlingsanzucht bei Kernobst.* (*New results in breeding seedlings of pome fruits*). (*pp. 1185–96*).

Plantations have now been made in which both seed parent and pollinator are known to be varieties that give seedlings suitable for use as rootstocks in Germany. They are not yet in production however and a number of other factors that can influence the quality of the seedlings are here discussed; they include seed weight, the heaviest seeds giving rise to more vigorous seedlings. A wind-sorting machine and a seed drill capable of sowing single seeds at a spacing of 2·5–5 cm. are described.

4315 *Kajiura, M. The breeding of new varieties of Japanese chestnut resistant to chestnut gall wasp* (Dryocosmus kuriphilus *Yasumatsu*). (*pp. 1243–49*).

Six early varieties with resistance to the above pest and nuts of good quality have been developed by hybridization and are now undergoing tests for vigour, yield and resistance to blight. The variety Ginyose has behaved as though homozygous for a dominant gene controlling resistance.

4316 *van der Knaap, W. P. Observations on the pollination of cacaoflowers.* (*pp. 1287–92*).

The author draws upon the literature and his own observations to show that both self incompatibility and insufficient natural pollination may be factors limiting yield. He has confirmed that the number of pollinated flowers depends partly upon the size of the *Forcipomyia* population and upon the position of the flowers on the tree. A preliminary experiment suggested that flowers of a self-incompatible tree may undergo self pollination if pollen from a self-compatible individual is applied up to 24 hours after selfing.

4317 *Chapot, H. & Praloran, J.-C. Les graines de citrus.* (*Citrus seeds*). (*pp. 1294–323*).

Detailed descriptions and illustrations of the seeds are given for *Poncirus trifoliata*, *Fortunella margarita* and a number of *Citrus* species. The characters studied include the degree of polyembryony and certain features that tend to be correlated are mentioned.

4318 *Horovitz, S. Sex in* Carica papaya. (*pp. 1324–34*).

Continued investigations (cf. *PBA*, XXV, Absts. 2358 and 3397) have led the author to conclude that sex in *C. papaya* is determined by the multiple alleles *f* for feminity, F^h for masculinity and *F* for the andromonecious condition, respectively situated on the chromosomes designated m, M_1 and M_2 by Hofmeyr. F^h is regarded as a duplication consisting of $F + f$. A fourth allele f' on m appears to be a duplication of *f*. A large active region common to all three sex chromosomes contains the partially sex-linked loci *Mp*, *Ga*, *B*, *Y* and *P* for characters described by Storey and Hofmeyr. These loci are situated on one side of that for sex; on the other side is situated an identical inert region in M_1 and M_2 and a corresponding nonlethal region in m. Sex depends upon the dose balance of *F* and *f*. The genotypes and sexual indices (F/f) of the various forms are as follows: female, ff, ff' or $f'f'$, 0; andromonecious type B bearing fruits throughout the year, F^hf', 0·33; andromonecious type C with staminate periods, F^hf, 0·50; labile male, Ff', 0·50; and constant male, Ff, 1. The author repeats his hypothesis that sexual variability depends upon the relative proportions of enzymes produced by *F* and *f*. Formulae are given for the frequencies of sexual forms in populations in equilibrium.

4319 *Popenoe, W. Systematic pomology in tropical America.* (*p. 1345*).

The desirability of more attention to the above subject is stressed in view of the increasing number of new seedlings.

4320 *Toxopeus, H. J. Breeding of stocks for citrus resistant to gum-disease and 'mal tristeza'.* (*pp. 1423–27*).

Work conducted in Java before world war II to produce interspecific-hybrid stocks resistant to both tristeza and *Phytopthora* gum disease is described. Four of the stocks have survived.

4321 *Bolhuis, G. G. Some observations on the fruiting of the groundnut.* (*pp. 1482–84*).

Difficulties were encountered during hybridization in Java because the mother plants did not die off at the normal age of 100 days but remained green for a further 30–40 days. For dying-off at the normal age, at least 8 pods should be present; since only about 50% of pollinations lead to fruiting in artificial crossing at least 16 pollinations per plant are necessary.

4322 *International conference on the improvement of vegetable varieties at Wageningen Netherlands on August 26 and 27, 1955* (*pp. 1531–647*).

This special conference was concerned with two main themes: principal trends in the development of new vegetable varieties and problems in the standardization and naming of vegetable varieties. O. Banga gave a Summary of some of the main points of the reports and the discussions on the first subject (cf. *PBA*, XXVI Abst. 3839).

The following reviews of developments in different countries were contributed: Summary of contributions from the various agricultural departments of Australia; Entwicklung und Ziel der Gemüsesamenzüchtung in Österreich (Development and objectives of vegetable breeding in Austria), F. Philip; Évolution de l'amélioration des plantes potagères en Belgique de 1945–1955 (Development of vegetable breeding in Belgium from 1945 to 1955), A. Lecrenier and M. Tilquin; Canadian vegetable breeding projects and breeding achievements, C. Walkof; Principal trends in the development of new vegetable varieties in Denmark, E. Blankholm; Breeding vegetable varieties in Egypt, A. Mahronki; Tendance française des variétés de légumes (French tendencies as regards vegetable varieties), G. Trébuchet; Stand und Zuchtziele der Gemüsezüchtung in Deutschland (Position and objectives in vegetable breeding in Germany), H. Basse; Breeding of vegetable varieties in Great Britain, J. C. Haigh; General trends in the development of new vegetable varieties in Japan, K. Kanazawa; Development of vegetable varieties in Holland, O. Banga *et al.*; Report on vegetables [in New Zealand]; Principal trends in the development of new vegetable varieties in Norway, A. H. Bremer and A. R. Persson; Report on the most important tendency in the development of new vegetable crops, and the most important vegetable crops in South Africa; Die Züchtung von Gemüsesorten in Schweden (Breeding vegetable varieties in Sweden), A. Lamprecht; and Ein kurzer Beitrag über Zustand und Tendenzen in der Entwickelung des Gemüsebaues in Jugoslavien (A short note on the position and tendencies in the development of vegetable growing in Yugoslavia), M. Dobrenov.

In the section on the second theme, O. Banga again contributed the Summary of some of the main points of the reports and the discussions (cf. Abst. 1524). The three reports presented were: Exposé relatif au thème 2 (Note on Theme 2), F. Ninnin; Quelques données sur l'indentification des variétés et des races des espèces potagères autogames (Some data on the identification of varieties and races of self-pollinating vegetable species), R. Fourmont; and the naming of varieties, O. Banga.

Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1955 to 30th September, 1956 (1957) : Pp. 196.

4323 *Rogers, W. S. Pomology.* (*pp. 9–15*).

Pome fruits. Fruits and seeds have been obtained from crosses between the pear-quince hybrid, *Pyronia veitchii* var. *luxemburgiana*, and Cox's Orange apple and further crosses between pears and apples have been made.

Selection among the seedlings from crosses between Cox's Orange and late flowering varieties has yielded over 900 late leafing seedlings and the progeny from several crosses is being tested for resistance to woolly aphid. Further selection of apple and pear seedlings which are now in full fruit production has been made on the basis of fruit quality or extended season. The cytology of a sport of Laxton's Superb is under investigation.

Prunus. Poor germination of seeds has been encountered in the progeny of crosses between mazzard rootstocks and several *Prunus* species (cf. *PBA*, XXVI, Abst. 3664).

Raspberry. Seedling 30/8, from a self of Pyne's Royal crossed with a self of Lloyd George, has now been inbred for three generations. It shows good vigour and is apparently homozygous for large fruit. Several characters are being transferred to it, including resistance to *Amphorophora rubi*, from Baumforth A and a derivative of Chief, thornlessness and fruit quality. Germination of S_2 plants of Norfolk Giant was very slow but when the plants became established their vigour was good. A large family grown from open pollinated seed from an isolated area of Reid's Seedling, a self of Burnetholm, proved uniform for thornlessness and contained many vigorous plants.

One very vigorous triploid seedling from Lloyd George x *Rubus palmatus* has been retained but all progeny from this cross are characterized by extreme thorniness and a branching habit and are not expected to be of commercial value. Studies of the genetics of resistance to *A. rubi* have continued and chromosome counts made of several *Rubus* species.

Currants and gooseberries. Fertile hybrids between black currant and gooseberry have been obtained by colchicine treatment (cf. Abst. 4326). Crosses have also been made between black and red currants and back crosses made to gooseberries from the hybrids between *Ribes oxyacanthoides* and gooseberries. Other interspecific hybrids were made with a view to elucidating some aspects of cytological differentiation in the genus.

4324 *Harris, R. V. Plant pathology.* (*pp. 25–30*).

Testing of hop seedlings for tolerance to *Verticillium albo-atrum* has continued, three of those

tested during the year proving comparable to OR55 in this respect.
The resistance of 29 clonal apple rootstocks to five isolates of *Phytophthora cactorum* has been investigated and marked differences both in resistance and pathogenicity have been found.

4325 *Massee, A. M. Entomology.* (*pp. 31–34*).
Seedlings of Cox's Orange Pippin x Northern Spy have continued to show resistance to woolly aphid. Some seedlings from the crosses Court Pendu Plat x Northern Spy and Crawley Beauty x Northern Spy, tested for the first time, showed resistance but all seedlings from Crawley Beauty x Court Pendu Plat were susceptible.

4326 *Knight, R. L. & Keep, E. Fertile black currant-gooseberry hybrids.* (*pp. 73–74*).
Sterile seedlings from a cross between Boskoop black currant and Green Ocean gooseberry were treated with 0·6% colchicine in 1954 and in 1956 two of these treated seedlings, B21/1 and B21/17, flowered and proved to be fertile. The former gave seeds when self pollinated and when pollinated by Whinham's Industry and colchicine-treated Lancer gooseberries. Seeds were also produced when Whinham's Industry was pollinated by B21/1.
In an attempt to transfer genes controlling fruit size from the gooseberry to the black currant, crosses were made to two tetraploid black currants, B5/6 and B5/7, seed being obtained from B5/7 x B21/17.

4327 *Tydeman, H. M. A description and classification of certain plum rootstocks.* (*pp. 75–80*).
A detailed description is given, illustrated by photographs, of 23 varieties of plum rootstocks together with a scheme for their identification.

4328 *Preston, A. P. Growth and cropping of some new dessert apples.* (*pp. 81–84*).
Data are presented on tree size, time of blossoming and picking, total crop, fruit size and regularity of bearing of three new dessert apple varieties compared with three standard varieties. The new varieties are Tydeman's Early Worcester and Tydeman's Late Orange (Tydeman's Late Cox), described in *PBA*, XVII, Abst. 517, and Harvest. The latter is an early red apple selected from Devonshire Quarrenden x Worcester Pearmain, ripening about 10 days after Beauty of Bath, yielding nearly three times as much and bearing larger fruit. It is not being released at present since it is not yet known whether its fruit size will deteriorate as the trees age, as happens with the Devonshire Quarrenden parent.

4329 *Turrell, F. M. & Bentley, L. E. Buffer capacity and pH of tissue fluids of leaves of sulphur-resistant and sulphur-shy varieties of apple* (Pyrus malus *L.*) *and gooseberry* (Ribes grossularia *L.*). (*pp. 114–24*).
Sulphur-shy varieties of apple (Stirling Castle and Lane's Prince Albert) and gooseberry (Leveller), whose leaves are readily injured by sulphur, were found to have a higher pH and lower buffer capacity than sulphur-resistant varieties (Worcester Pearmain apple and Keepsake gooseberry), whose leaves do not readily suffer injury from the application of sulphur.

Proceedings of the Florida State Horticultural Society held at Orlando, Florida, November 7, 8 and 9, 1956 : **69** : Pp. 128.

4330 *DuCharme, E. P. & Birchfield, W. Physiologic races of the burrowing nematode in relation to citrus spreading decline.* (*pp. 42–44*).
Three physiological races of *Radopholus similis* characterized by their ability to parasitize either bananas or *Citrus* spp. or both, have been identified in Florida. No morphological differences could be detected between the three races.

4331 *Ford, H. W. Citrus rootstock selections tolerant to the burrowing nematode* (*pp. 44–51*).
Two rough-lemon clones, studied at the Florida Citrus Experiment Station, have been found to be tolerant of *Radopholus similis*, although a high population of the nematodes occurs on the roots and growth is somewhat reduced. A third rootstock, not yet identified, was found to be resistant and to produce a toxic factor in the cortex. No depression of growth occurred and the nematode population in the soil surrounding the roots decreased or disappeared.

4332 *Hoover, M. W. & Nettles, V. F. Effect of variety and fresh storage upon the quality of frozen sweet potatoes.* (*pp. 142–45*).
After curing and freezing, Georgia Red sweet potatoes received the highest rating for colour, texture and flavour but Goldrush and Hartogold contained considerably more carotene.

4333 *Whitner, B. F.* (*Jun.*). *Progress report on cantaloupe varieties.* (*pp. 195–98*).
Work in progress in Florida is briefly surveyed.

4334 *Lorz, A. P. Breeding objectives and the establishment of new breeding lines of southernpeas.* (*pp. 210–15*).
Tables are given showing the cowpea varieties used in breeding at present in Florida and the characteristics for which they were selected and also the characteristics and parentage of 1

advanced breeding lines. High yields have been given in small field trials by 71 0 70 1 0 (28 1 9 x 6 4 1), a brown, semi-crowder type, and 73 0 5 1 1 0 (28 1 9 x 11 5 1), a cream-seeded line.

4335 *Ledin, R. B. A comparison of three clones of Barbados cherry and the importance of improved selections for commercial plantings.* (*pp. 293–97*).

Of three *Malpighia* clones under observation since 1949 at the Sub-tropical Experiment Station, Homestead, Fla. a semi-sweet clone has been outstanding, giving fairly large, sweet fruit and it is proposed to name it Florida Sweet Barbados cherry. It forms an erect bush, vigorous in growth and high yielding and appears hardier than the other clones tested. It shows considerable variation when grown from seed. The original clone was selected from a plant in the Dade County Nursery, Fla.

4336 Brooks, R. M. & Olmo, H. P.
Register of new fruit and nut varieties. List 11.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 611–31.

A further descriptive list of varieties of fruits and nuts recently introduced in the USA is given (cf. *PBA*, XXVI, Abst. 3662).

4337 Johansson, E.
Undersökningar av befruktningsförhållanden hos fruktsorter vid Alnarp 1945–1955. (**Investigations on fertilization relationships in fruit varieties at Alnarp, 1945-1955**).
Medd. Trädgårdsförs. 1956 : No. 101 : Pp. 56.

Data on flowering time, pollen fertility and intervarietal and interspecific compatibility relationships are presented for numerous apple, pear and plum varieties and on pollen fertility and compatibility for smaller numbers of apricot, peach and cherry varieties and of *Prunus* species which are used as rootstocks for plum, peach and apricot. Among the interspecific crosses effected were the pear Esperens Herre (= Seigneur d'Esperen) x *Pyrus ussuriensis*, *Prunus cerasifera* x *P. armeniaca*, *P. triflora* 'Beauty' x *P. domestica* 'Opal' and *P. persicoides* x *P. amygdalus*.

4338 Floor, J.
Verslag van onderstammen-onderzoek. (**Report on rootstock investigations**).
Meded. Inst. Vered. TuinbGewass. 1957 : No. 101 : Pp. 32.

This report includes descriptions of Malling-Merton and other recently developed apple rootstocks and gives an account of breeding work at the Wageningen Institute for Breeding of Horticultural Crops, Netherlands, on dwarfing rootstocks for cherry, some promising selections for this purpose having been obtained from *Prunus incisa* and *P. kurilensis*.

4339 Zečević, L. M. & Pantelić, M. B.
(**A contribution to the study of pollen germination of some species of fruits**).
Zborn. Rad. Inst. Fiziol. Razvić. Genet. Selekc. (Rev. Wk. Inst. Physiol. Develop. Genet. Select.)/Rec. Trav. Inst. Physiol. Développ. Génét. Sélect., Beograd 1956 : No. 4 : 101–16. [Serbian].

Boric acid promoted pollen germination in all the following species: apple, pear, quince, sweet cherry, raspberry, blackberry and cultivated and wild strawberries.

4340 Zalewski, W.
Próba ustalenia gatunków i odmian owoców na podstawie chromatograficznego oznaczania barwników. (**An attempt to identify fruit genera and varieties on the basis of chromatographic determination of pigments**).
Prace Inst. Sadownict. Skierniewicach 1955 : **1** : 157–68.

Generic and varietal differences could be distinguished by chromatographic analysis of the fruits of 7 strawberry, 15 cherry and 8 plum varieties. The possibility of using the method for varietal identification is discussed.

4341 Jordan, C., Korte, F. & Sengbusch, R. von
Die papierchromatographische Bestimmung der einzelnen Säure- und Zuckerarten als Grundlage für die Auslese auf Wohlgeschmack bei Obst, Beerenobst und Gemüse. (**The estimation of individual acids and sugars by paper chromatography as a basis for selection for flavour in fruits, berries and vegetables**).
Züchter 1957 : **27** : 69–76.

By tasting tests carried out on some 100,000 strawberry clones it has been possible to select some which do not develop the characteristic taste after freezing. A method is now described whereby individual organic acids and fructose, glucose, sucrose, maltose and lactose can be estimated together by paper chromatography. The results of estimations on a great number of fruit and vegetable species are presented. They correspond roughly to the assessment of the

given species by tasting, on the basis of acidity and sweetness. Comparisons of different varieties of oranges revealed clear differences in the acid content but less in sugars; in apples varietal differences in both acids and sugars were detected; some apples are sour because of high acid content, others on account of low sugar. Five strawberry varieties showed differences in both acid and sugar content after deep freezing; these differences correspond to clear differences in the flavour of the varieties, but again a pleasant flavour may result from either a low content of malic acid or a relatively high proportion of citric acid, as in the varieties Senga 146 and Georg Soltwedel respectively. Analyses of vegetable varieties revealed one red beet with high contents of fructose and glucose and low sucrose, whereas all others contained predominantly sucrose. The significance of this finding for sugar-beet breeding is pointed out. A further possibility opened up by the method is the breeding of varieties high in particular sugars or acids, such as vegetable varieties containing only fructose, and for special combinations conditioning a particular flavour.

4342 Hylmö, B.
Sortfrågor med hänsyn till konservindustrien. Svenska erfarenheter. (**Varietal questions with reference to the preserving industry. Swedish experiences**).
Nord. JordbrForskn. 1956 : **38** : 382–85.

Jørgensen, M. B.
Sortfrågor med hänsyn till konservindustrien. Danske erfaringer. (**Varietal questions with reference to the preserving industry. Danish experiences**).
Ibid. 1956 : **38** : 386–88.

Ljones, B.
Sortfrågor med hänsyn till konservindustrien. Norske erfaringer. (**Varietal questions with reference to the preserving industry. Norwegian experiences**).
Ibid. 1956 : **38** : 389–92.

In the Swedish paper a plea is put forward for more breeding of varieties of fruit and vegetable specifically for the preserving industries. The Danish paper includes a bibliography on recent Danish varietal trials. The results of quality trials of varieties of tree and bush fruits are reported in the Norwegian contribution.

4343 Djurdević, B.
Osetljivost sadnica raznih sorti jabuka šljiva prema zimskim mrazevima 1953/5 u Peći. (**The susceptibility of th seedlings of different apple and plum tree varieties to winter frost i 1953/4 at Peć**).
Arh. poljpr. Nauk 1956 : **9** : No. 23 49–60.

Among a large number of seedlings tested, 4 apple and 3 plum varieties proved hardy.

4344 Panjkov, R. K.
(**The best local varieties of appl and pear in the Ljvov province**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 No. 2 : 48–50. [Russian].

Many varieties of apple and pear, all notabl for hardiness, high yield and good quality fruit are described. Most are dessert varieties bu some are used for preparation of musts, drie products and other technical processes. Som forms show resistance to diseases and drough and are characterized by good transportabilit and keeping properties.

4345 Penënžek [Pieniążek], S. A.
(**At the Polish Institute of Horti culture**).
Priroda (Nature), Leningrad 1957 No. 4 : 58–62. [Russian].

References are made to hybridization betwee Mičurin and American apple varieties and th use of polyploidy, involving tetraploids of suc apple varieties as Belyĭ Naliv [White Juice] Wealthy, Rome Beauty and McIntosh.

4346 Zwintzscher, M.
Wachstum und Ertrag als Zuchtziel bei Obst. Eine Beurteilung von Apfe Klonen. (**Growth and yield as breeding objective in fruit. A assessment of apple clones**).
Z. Pflanzenz. 1957 : **37** : 159–84.

Measurements of 38 clones arising from a numbe of different seedlings showed significant diffe ences between clones in respect of annua increase in stem diameter, number of branche produced, their length and number of inte nodes, height and form of crown, set of flowe and fruit and fruit yield. Some clones had clear tendency to bear fruit in alternate year while others were more regular. In addition t differences in total yield, there were significan differences also in number of fruits, size an average weight of fruit and its specific weigh All these values varied also according to th rootstock on which the clone was propagate

and comparisons between clones are only valid so long as they relate to material on the same rootstock.
The average yield over six years from the best clone was over 27 kg. and that from the poorest about 1 kg.; these compare with 6–10·8 kg. from well-known commercial varieties grown under roughly comparable conditions. One of the clones possessing the best combination of desirable characters was clone 12, with an average yield of 25·2 kg., fruit weight of 97·6 g. and specific weight of 0·86; the fruits are yellow with red stripes, and good in quality and keeping capacity; in spite of the somewhat excessive size of the crown the variety has been released under the name Erwin Baur. Clone 18 is distinguished by extreme earliness and though its yield is low its fruits are very regular in size and high in quality. Clone 4 is small, yields many fruits (16 kg.) of even size and good quality and keeping capacity, and is almost free from June drop; clone 40, with a small crown and yield of 10·2 kg. of fruits, with specific weight of 0·82, gave distinctly better values when grafted on EMXVI, when the yield increased to an average of 13·1 kg. and the fruit weight to 147·3 g.
From these results it is concluded that a considerable increase in yield can be achieved by breeding apples, in addition to the improvements in quality and disease resistance that have been the main aim in breeding in the past.

4347 Pavljukov, G. I.
(Apple varieties obtained by popular selection).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 4 : p. 61. [Russian].
Mention is made of old apple varieties such as Čerkesskiĭ Rozmarin [Čerkessian Rosemary] and Černomorskoe Krasnoe [Black Sea Red] found in the Krasnodar territory. They are distinguished mainly by high yield and good keeping properties. The fruit is large and the flesh has a good flavour. The trees are vigorous and long-lived.

4348 **Merton Beauty ready in the autumn.**
Grower 1957 : **47** : p. 1234.
The apple Merton Beauty (Cox's Orange Pippin x Ellison's Orange), developed at the John Innes Institution, England, bears pale-yellow fruits with a crimson flush over most of the surface and generally with some slight russeting. The flesh is tender and juicy, the flavour sweet or very slightly acid and the aroma suggestive of that of the first-mentioned parent. The variety ripens after Worcester and before Cox's Orange.

4349 Duggan, J. B. & Williams, R. R.
Cider apples. A revised list of recommended varieties.
Agriculture, Lond. 1957 : **64** : 11–15.
Information is given on the orchard behaviour of varieties recommended for general and limited planting in England. Suitable pollinating varieties are also indicated.

4350 Guinea, E.
Manzanas de España. **(Apples of Spain).**
Inst. Nac. Invest. Agron., Madrid 1957 : Pp. 209.
After an introduction discussing the definition of the term variety, nomenclature and the systematic morphology of apple fruits, descriptions accompanied by coloured illustrations are presented of the fruits of 104 apple varieties grown in Spain.

4351 Slović, D.
(Apple cultivation in the environs of Prespa).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje : Zemjod. : 1954/55 and 1955/56 (1956) : Nos. 8–9 : 73–126. [Serbian].
Descriptions are given of local and introduced varieties cultivated around lake Prespa. Among the former, the late variety Tetovka is rated highly for its sweet flavour, good keeping properties and high yield.

4352 Roy, P. O.
Les variétés de pommes. **(Apple varieties).**
Rapp. ann. Soc. Pomol. Cult. fruit. Québec 1954 : 44–46.
A brief account is given of varieties recently introduced to or bred in Canada.

4353 Klein, L. G.
Introducing the Barry apple.
Fm. Res. 1957 : **23** : No. 2 : p. 14.
The above variety has been developed from a cross between McIntosh and Cox's Orange Pippin by the New York State Agricultural Experiment Station, Geneva, NY. It is described as a high-quality dessert apple, dark red in colour, ripening between Early McIntosh and McIntosh, and it may also be used for cooking. The tree is similar to McIntosh but it flowers two or three days later and is expected to be a good pollinator for other varieties since it is a diploid.

4354 Sobajima, Y.
(Studies on the geographical distribution of races of the apple rootstock *Malus sieboldii*. I. The ecological and geographical distribution of *M. sieboldii* in the districts of Hokkaido, Aomori and Nagano).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 7 : 77–80. [Japanese].

An account is given of the distribution and racial differentiation of the above and some related species in northern Japan.

4355 **Tetraploid limb.**
Bett. Fruit 1956 : **51** : p. 22.

A tetraploid branch of the normally triploid apple Winesap was discovered in a commercial orchard in Washington State. It has been pollinated with 2*n* varieties to produce 3*n* seedlings.

4356 Kimura, M. & Kunimura, N.
(Studies on cuttings from apple rootstocks).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 8 : 64–73. [Japanese].

Differences in the rooting capacity of cuttings from different strains of *Malus sieboldii* are noted.

4357 Volkova, N. K.
(The inheritance of the fruit quality and other characters of Aport by the hybrid progeny and changes in these under the influence of mentors).
Agrobiologija (Agrobiology) 1956 : No. 5 : 62–69. [Russian].

An account of breeding work on apples involving Aport as ♂ or ♀ parent, together with descriptions of some of the hybrids, at Talgar, Alma Ata, is presented. All hybrids of Aport, except where the other component was a wild form such as *Malus niedzwetzkyana*, produced high-quality fruits as large as those of Aport or interm diate between those of Aport and the other parent. A number of hybrids distinguished by high quality are listed. In the case of Aport x Orleans Reinette and several others, the size, pigmentation and flavour were improved by grafting the hybrids on another variety. Some hybrids, for instance Zelenka [Green] x Aport, have good keeping properties.

4358 Anjou, K.
Undersökningar över C-vitaminhalten nedärvning hos äpple. **(Investigation on the inheritance of vitamin C content in apple).**
Frukt i år (The year's fruit). Sverig pomol. Fören. Årsskr. 1956 : 61–68.

At Balsgård, Sweden, crosses between varietie with a high ascorbic acid content (ca. 45 mg. % on the one hand and varieties with a low conten (ca. 3–7 mg. %) on the other have yielde progenies with wide ranges of vitamin C, in cluding a few trees with a high content (ca 40 mg. %). A wide range of 2–23 mg. % wa found among the progenies of crosses betwee intermediate varieties, while the highest valu in the progenies of crosses between varietie with a low content was 10 mg. %. The exclusiv use of varieties rich in vitamin C is recommende in breeding for high content.

4359 Proebsting, E. L.
Tree nutrient sprays.
Calif. Agric. 1957 : **11** : No. 3 : p. 10.

Differences have been found in California between apple varieties in respect of thei absorption of urea applied as a foliar spray Gravenstein absorbed nitrogen in this form readily while Golden Delicious did not.

4360 Vuorinen, J.
Omenalajikkeiden talvenkestävyydestä **(The winter hardiness of apple varieties).**
Koetoiminta ja Käytäntö 1956 : **13** p. 30.

A large number of Finnish and foreign appl varieties are compared for their powers of winte survival, both as young and as mature trees.

4361 Anjou, K.
Frysningsförsök med äpplegrenar—tidpunktsfrysningar. **(Freezing experiments with apple twigs—seasona freezings).**
Frukt i år (The year's fruit). Sverig pomol. Fören. Årsskr. 1956 : 43–50.

The results of artificial freezing experiments or apple twigs (cf. *PBA*, XX, Abst. 1861), carrie out at intervals from the beginning of Novembe to the middle of April in the winters of 1952–55 are reported for 22 varieties. Both varietal and seasonal differences in frost hardiness were observed, the greatest resistance to freezing damage occurring in February in all varieties.

4362 Nikitin, G. N.
(New apple varieties in the Primorje).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 2 : 39–40. [Russian].
Descriptions are given of Oktjabrjskoe [October], Rebristoe [Ribbed], Amurskoe Urožainoe [Productive Amur], Sinap Amurskiĭ [Amur Sinap] and Habarovsk. They were obtained in the Soviet Far East by crossing Reinettes or hardy small-fruited local varieties such as Epemovskoe 1 with Antonovka Šestisotgrammovaja [Six-hundred Gramme Antonovka], Danzigskoe Rebristoe [Danzig Ribbed] and other high-quality large-fruited varieties. Most produce larger fruits of better quality than the local forms and are productive, hardy and resistant to *Monilia*, *Venturia* and scorching.

4363 Julien, J. B. & Spangelo, L. P. S.
Physiological races of *Venturia inaequalis*.
Canad. J. Pl. Sci. 1957 : **37** : 102–07.
Evidence has been obtained of the occurrence of physiological races in Canada.

4364 Devjatov, A. S. & Kalašnikova, A. I.
(Quinces in the Stalingrad province).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 2 : 42–43. [Russian].
Mention is made of the new varieties Stalingrad, Ahtubinsk and Volga from the Stalingrad Horticultural Research Station. They are productive, hardy and have high quality fruits with good keeping properties.

4365 L'importanza della selezione clonale nelle piante da frutto. **(The importance of clonal selection in fruit trees).**
Frutticoltura, Bologna 1956 : **18** : 390–91.
The principles of clonal selection are briefly outlined and examples are given of somatic mutations in peaches, plums, prunes and apricots which have been selected in France.

4366 Evreinoff, V. A.
Les ancêtres de nos abricotiers. **(The ancestors of our apricots).**
Fruits Prim. Afr. N. 1955 : **25** : 208–11.
A popular survey of seven species of the genus *Armeniaca* is presented, information being given on the morphological characteristics, resistance to cold and diseases, fruit quality, geographical range and principal varieties. All seven are native to Asia. Wild *A. vulgaris*, now limited to central Asia, northern China and small discrete areas near the Caucasus, is thought to have had a wider early distribution extending to Armenia and Iran.

4367 Jusubov, A. M.
(Pollinators for new apricot varieties in the Central Belt).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 2 : 47–48. [Russian].
Triumf Severnyĭ [Northern Triumph], Podarok [Gift], Desertnyĭ [Dessert], Mečta [Dream] and several others were obtained at Voronež by crossing southern with Mičurin or Transbaĭkal varieties. All these are hardy and their flavour is fair. The above named varieties are self fertile, others are nearly or completely self sterile. Good pollinators for all these varieties are listed.

4368 Johansson, E.
Sort och grundstamförsök med plommon vid Alnarp 1943–56. **(Variety and rootstock trials of plums at Alnarp, 1953-56).**
Medd. Trädgårdsförs. 1957 : No. 108 : Pp. 20.

Johansson, E.
Sortförsök med plommon. **(Varietal trials of plums).**
Försök o. Forskn. 1957 : **14** : 55–56.
Information on the growth, fruit yield and quality of trees grown in three trials on their own roots and on various rootstocks is presented.

4369 Mišić, P. D.
Prilog proučavanju degeneracije muških polnih elementata u procesu mikrosporogeneze šljive crvene ranke. **(A study of the degeneration of the male reproductive elements at microsporogenesis of the plum Crvena Ranka).**
Arh. poljopr. Nauk. 1956 : **9** : No. 24 : 76–80.
Cytological observations at Čačak showed that Crvena Ranka [Red Early] has 48 chromosomes. Meiosis of the pollen mother cells is regular and normal tetrads are formed. The pollen grains degenerate, however, at the uninucleate stage.

4370 Fogle, H. W., Blodgett, E. C., Carter, G. H., Ingalsbe, D. W. & Neubert, A. M.
A comparison of several Italian-type plum varieties.
Proc. Wash. St. hort. Ass. 1955 : **51** : 109–13.
The article chiefly describes an analysis of the chemical and other factors involved in the suitability of the fruits of several varieties for canning.

4371 Oldén, E. J.
Vinterhärdigheten hos plommon efter undersökningar utförda åren 1952–1956. **(Winter hardiness in plums according to investigations carried out in the years 1952-1956).**
Frukt i år (The year's fruit). Sverig. pomol. Fören. Årsskr. 1956 : 89–111.
Details are given of the results of freezing experiments conducted at Balsgård, Sweden, on twigs of 24 diploid and 50 hexaploid plums. Varieties which shed their leaves late in autumn tended to be among the least hardy.

4372 Floor, J.
Report on the selection of a dwarfing rootstock for cherries.
Euphytica, Wageningen 1957 : **6** : 49–53.
Selections of *Prunus incisa* and *P. kurilensis* obtained at the Institute of Horticultural Plant Breeding, Wageningen, show promise as dwarfing rootstocks.

4373 Fernqvist, I.
Transportförsök med körsbär. **(Transport tests of cherries).**
Medd. Trädgårdsförs. 1957 : No. 103 : Pp. 24.
Details are given of the effects of transport on 17 sweet cherry and 3 sour cherry varieties grown and tested in Sweden.

4374 Carter, G. H., Ingalsbe, D. W., Neubert, A. M. & Fogle, H. W.
Fresh-fruit and canning qualities of some sweet cherry varieties.
Proc. Wash. St. hort. Ass. 1955 : **51** : 102–05.
Some varieties developed in the USA and Canada during recent years and now under test in Washington State are compared with current commercial varieties in the state.

4375 **In search of new peach varieties.**
Fmg. in S. Afr. 1957 : **33** : 23–26.
Crosses have been made at the Roodeplaat Horticultural Research Station involving Bell's November, C. O. Smith, Babcock, Culemborg and Early Dawn with the aim of developing a later-flowering peach variety with firmer fruits than those of existing varieties.

4376 Reggiani, F.
Una nuova varietà di pesco: la "Donna Mary". **(A new peach variety : Donna Mary).**
Frutticoltura, Bologna 1957 : **19** : 124–31.
This new Italian variety, developed from a cross between Admiral Dewey and Early Elberta grows vigorously and gives high yields. The fruit is early maturing, large and round, of a deep yellow colour spotted with red. It does not bruise readily in handling or transport.

4377 Jones, T. H.
Variety studies of peaches in Tennessee.
Bull. Tenn. agric. Exp. Sta. 1956 : No. 250 : Pp. 11.
The bulletin gives short descriptions of 18 recommended varieties, a discussion of the behaviour of varieties in relation to cold injury and a summary of information obtained on the chief economic characters of approximately 100 varieties.

4378 Kimura, M. & Kunimura, N.
(Pollen germination tests of peaches).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 8 : 61–63. [Japanese].
Intervarietal differences in pollen germinability are noted. Pollen stored in the dark at 0–2° C. remained viable up to 40 days.

4379 Bhattacharya, S. C. & Dutta, S.
Classification of citrus fruits of Assam.
Sci. Monogr. Coun. agric. Res. India 1956 : No. 20 : Pp. 110.
Citrus spp. and their wild and horticultural varieties in Assam are classified. One of the species described, *C. assamensis*, is new. Probable hybrids, some of which are regarded as being of considerable commercial promise, are also described.

4380 Oršanskaja, V. N. & Ordžanikidze, N. P.
(A quick laboratory method of testing citrus fruits for resistance to mal secco).
Agrobiologija (Agrobiology) 1956 : No. 5 : 35–44. [Russian].
The method involves placing cuttings in a liquid culture of *Deuterophoma tracheiphila* for 2 hr.–3 days. Among the material which showed a fair degree of resistance was the lemon hybrid Novogruzinskiĭ [New Georgian] x Meyer and also the lemon varieties 1641 and Monachello after having been grown on *Poncirus trifoliata* stocks.

4381 Salerno, M.
Osservazioni biologico-sistematiche su *Botryosphaeria ribis* Gross. et Dugg., agente di un cancro gommoso degli agrumi. (**Biological and systematic observations on *B. ribis* Gross. and Dugg., causal agent of a gummy canker of citrus trees**).
Ann. Sper. agr. 1957 : **11** : 741–74.
Differences in the pathogenicity of isolates have been found but do not correspond with morphological differences observed between these isolates in culture.

4382 Fedorov, A. A.
(**An interesting case of an anomaly in the fruit structure of a hybrid of sweet orange with trifoliate orange**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1474–78. [Russian].
A hybrid of *Citrus sinensis* x *Poncirus trifoliata* bore a number of fruits in which the sections were partially fused, giving the fruits a certain resemblance to those of the fingered citrons and even to those of related genera, such as *Ruta* or *Haplophyllum*, in the subfamily Rutoideae.

4383 Cameron, J. W., Soost, R. K. & Frost, H. B.
New Satsuma mandarin strains.
Calif. Agric. 1957 : **11** : No. 3 : 13, 15–16.
The yield and fruit characters of two nucellar lines selected in California from Satsuma (= Unshu) mandarin are described and compared with those of the original line. Both are superior in all respects to their parent but young-line 1, also known as strain A, is more promising than young-line 2, or strain B.

4384 Krishnamurthi, S.
A note on the occurence of a seedless double-fruited rough lemon.
Indian J. Hort. 1956 : **13** : 212–13.
The occurrence is noted of a rough lemon tree, in the grounds of Annamalai University, bearing seedless fruits containing a group of smaller carpels at the basal end of the fruit, enclosed, together with the larger carpels, in a common wall.

4385 Dutta, S.
Cultivation of jack fruit in Assam.
Indian J. Hort. 1956 : **13** : 189–97.
The different varieties of *Artocarpus heterophyllus* grown in Assam are briefly described and a key is provided for their identification.

4386 Ito, I. & Mutsuura, O.
Studies on the induced polyploids of the North American pawpaws (I). Chromosome number and mixoploids in *Asimina triloba* Dunal.
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 8 : 57–59.
The chromosome morphology of *A. triloba* is described; 2*x*–4*x* and 4*x*–8*x* mixoploids have been obtained by colchicine treatment.

4387 Gerritsen, C. J.
De Feijoa een nieuw cultuurgewas? (**Feijoa, a new commercial crop ?**)
Meded. Inst. Vered. TuinbGewass. 1957 : No. 98 : 889–94.
The cultivation of *Feijoa sellowiana* for fruit is described and the possibility of improving its frost resistance for use in the Netherlands is discussed. Available varieties are noted.

4388 Gandhi, S. R. & Gopalkrishna, N.
"The Atemoya", a promising new Annona hybrid.
Proc. Indian Acad. Sci. 1957 : **45** : 234–46.
The leaf and fruit characters of five hybrids of *Annona cherimolia* x *A. squamosa* produced at the Ganeshkhind Fruit Experiment Station, Poona, are described. The contribution of each parent to the characters of the hybrids is indicated. Hybrid 2 is considered the best, showing marked improvement over both parents in seedlessness and edible quality. Atemoya is the name given by P. J. Wester to hybrids obtained from these species in Florida at the beginning of the century.

4389 Roy, R. S., Mallik, P. C. & Sinha, R. P.
Mango breeding in Bihar, India.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 259–64.
Breeding was initiated at the Sabour Agricultural Research Institute in 1941 to develop varieties with regular bearing and disease resistance. Information on floral biology and the technique of crossing used is followed by an account of intervarietal hybridization. Of the hybrids which have begun to bear fruit, two seedlings of Bombai x Kalapady, respectively named Mahmud Bahar and Probha Shankar, show promise in fruit and other characters. The former is noteworthy for its regular bearing and the latter for its apparent resistance to fruit fly and borer.

4390 Bakhshi, J. C. & Bajwa, B. S.
Identification of some mango varieties in the nursery stage.
Indian J. Hort. 1957 : **14** : 47–52.
A description of the leaf characters of six mango varieties commonly grown in the Punjab is given and the use of such characters for the early identification of varieties is recommended.

4391 Simão, S.
Considerações sôbre caracterização de variedades de mangueira. (**Considerations on the description of mango varieties**).
Solo, Piracicaba 1956 : **48** : No. 1 : 25–28.
Owing to cross pollination, the mango varieties of Brazil are in a state of great confusion as regards nomenclature and some guidance is offered concerning the principles that should be adopted in classifying them.

44th Annual Report of the Northern Nut Growers Association. Annual Meeting at Rochester, New York, August 31-September 1, 1953 : Pp. 178.

4392 *Caldwell, D. H. Natural variation observed in shagbark hickory,* Carya ovata (*Mill.*) *K. Koch. in Central New York.,* (*pp. 29–39*).
A detailed account is given of a study of the variation observed in 158 specimens of the above species in New York state. Although considerable variation was found it is not recommended that the species be subdivided.

4393 *Graves, A. H. & Nienstaedt, H. Chestnut breeding.* (*pp. 136–37*).
Further crosses have been made between Chinese, Japanese and American species of *Castanea* at the Connecticut Agricultural Experiment Station, New Haven, Conn. The Chinese-American hybrids are promising in respect of appearance and resistance to *Endothia parasitica.* One tree from a cross made in 1934 between *C. mollissima* and *C. seguinii* resembles the former species in habit but bears large numbers of nuts of good flavour.
Data on the pollen receptivity of female flowers indicate that the period of maximum receptivity, that is 9–17 days after anthesis, of *C. crenata* and of hybrid trees is shorter than that of *C. mollissima* whose female flowers are still fully receptive 22 days after anthesis.
The results of a bagging experiment indicate that Japanese x American and Japanese x (Japanese x American) hybrid chestnuts are almost completely self-sterile.

45th Annual Report of the Northern Nut Growers Association. Annual Meeting at Lancaster, Pennsylvania, August 30-September 1, 1954 : Pp. 142.

4394 *Rohrbacher, W. M. If I were starting a new planting of nut trees, what varieties would be chosen?* (*pp. 46–52*).
Brief descriptions are included of varieties of black walnut, butternut, chestnut and hazel together with observations on their performance in Iowa.

4395 *Barlow, A. L. Thomas walnut seed treatment with radioactive cobalt.* (*pp. 56–59*).
Data are provided on the germination of walnut seeds after treatment with seven different doses of γ radiation at the University of Michigan Fission Products Laboratory. Many of the seedlings from irradiated seeds were reddish in colour.

4396 *McDaniel, J. C. Hicans in Illinois.* (*pp. 68–77*).
Some characteristics of interspecific hybrids in *Carya* are discussed.

4397 *Talbott, J. The Woner pecan.* (*pp. 77–78*).
A seedling from a sample of nuts from Georgia planted in Indiana in 1932 has proved hardy and high yielding and is thought to be self fertile.

4398 *McKay, J. W. & Crane, H. L. Blossoming characteristics of horticultural varieties and seedling progenies of Chinese chestnuts.* (*pp. 93–98*).
Considerable variation occurs between seedling progenies of named varieties and unnamed selections in respect of habit, quantity of blossom and quality of fruit produced. Few of the seedlings under trial at Beltsville, Md., appear promising and most are inferior to grafted trees of the same age.

46th Annual Report of the Northern Nut Growers Association. Annual Meeting at East Lansing, Michigan August 29-August 31, 1955 : Pp. 138

4399 *Slate, G. L. The improvement of our northern nut trees.* (*pp. 24–27*).
Suggestions for the development of breeding programmes are briefly outlined.

4400 *Dunstan, R. T. Performance of hickory varieties in North Carolina.* (*pp. 65–70*).
Considerable differences have been found between varieties in respect of bearing behaviour, Stratford bearing when very young while

others have not yet begun to bear at ten years old. Fox, Berger, Wilcox, Romig, Weschcke and Burton are provisionally recommended.

4401 *Lefèvre, H. E. Hardiness of filberts in Quebec.* (*pp. 115–17*).
Nuts of good quality have been produced at Montreal by Italian Red, Bixby and Manoka, although the catkins of Italian Red and also of Medium Long may be killed by frost.

47th Annual Report of the Northern Nut Growers Association. Annual Meeting at New Haven, Connecticut, August 30-September 1, 1956 : Pp. 160.

4402 *Diller, J. D. Is our American chestnut developing blight resistance?* (*pp. 29–31*).
An account is given of the screening of chestnut trees reported as showing resistance to *Endothia parasitica* carried out by the US Forest Service. So far no tree has been found to possess sufficient natural resistance to warrant its further propagation.

4403 *Graves, A. H. Thoughts on the future of the American chestnut tree.* (*pp. 32–38*).
A brief survey of breeding for blight resistance at the Connecticut Agricultural Experiment Station is included.

4404 *Gossard, A. C. Effect of the pollen parent on Chinese chestnut seed.* (*pp. 38–45*).
Data are provided showing the effect of the pollen parent on the percentage of blossom producing fully developed burrs, the average number of nuts per burr and the average weight of the nuts produced by trees at the US Horticultural Field Station, Meridian, Miss. Different pollen parents were found to affect the weight and size of the seed produced by the same female parents.

4405 *McKay, J. W. Orange-kernel chestnut.* (*pp. 45–47*).
Three trees grown at Beltsville, Md., from seeds produced by a tree at Albany, Ga., were found to produce 2 to 6% of nuts containing orange kernels. The orange kernels contained 4·56 mg. total carotenoids and 0·31 mg. carotene per 100 gm. compared with 0·83 mg. total carotenoids and 0·09 mg. carotene per 100 gm. contained in normal kernels. In crosses between two of these trees the frequency of occurrence of the orange kernel character was raised to 16% in one case and 24% in another. A breeding programme designed to increase the percentage of orange kernels still further is briefly outlined.

4406 *Guengerich, H. W. Starking hardy giant pecan.* (*pp. 50–51*).
The above variety originated from a wild tree found in Missouri. The nuts are large, thin shelled and of excellent quality and the tree is self fertile. It is hardy and easily grafted. When grown in Missouri the nuts ripen in September, while in Florida, where the tree also grows well, they ripen in August.

4407 *Richterkessing, R. The Peruque pecan.* (*pp. 51–52*).
The original tree from which this variety has been propagated grows among others in St. Charles County, Mo. It gives good yields of good quality nuts and is said to be hardy. The variety grows better in moist soil.

4408 *McKay, J. W. & Crane, H. L. Two new pecan varieties for northern regions.* (*pp. 53–54*).
Two pecans growing near Washington, DC, are being released by the USDA under the names Duvall and Sweeney. Duvall originated from seed from Iron Mountain, Mo., while Sweeney is thought to be a seedling of Duvall. Both give good annual yields of small, high quality nuts, those of Duvall being slightly larger than those of Sweeney. They flower at the same time and are slightly protandrous.

4409 *Jones, D. F. Genetics of tree crops.* (*pp. 76–79*).
Among the topics mentioned in this popular article are the fact that cross pollination normally occurs in most trees, resulting in heterosis and variability in seedling progeny, and the selection and testing of parental clones and their progenies.

4410 *McKay, J. W. Walnut blossoming studies in 1956.* (*pp. 79–82*).
Hybrids have been produced at Beltsville, Md., between *Juglans regia* and *J. nigra*; they show considerable heterosis and have recently begun to flower. Data are provided on the period of flowering of these hybrids and of varieties of the two parental species. One of the hybrids, designated 41.24–P_9, flowers very late and is to be used in a back-cross programme designed to develop new late flowering varieties.

4411 *Becker, G. Carpathian English walnut pollination observations in Michigan test orchards, 1956.* (*pp. 82–89*).
A chart is included showing the dates of pollen shedding and stigma receptivity of 22 varieties at Climax, Mich., in 1956.

4412 *McKay, J. W. & Crane, H. L. Variability in chestnut progenies as related to breeding and propagation.* (*pp. 90–94*).
Seedlings from the variety Nanking are more uniform, vigorous and productive than those of other varieties so far tested at Beltsville, Md., irrespective of the pollen parent. Some other progenies are fairly uniform but many are extremely variable and only in some cases can the variation be attributed to pollination by different male parents.

4413 *Graves, A. H. Chestnut breeding—report for 1955 and 1956.* (*pp. 99–110*).
Further extensive interspecific hybridization has been carried out at the Connecticut Agricultural Experiment Station, the species used being *Castanea henryi, C. dentata, C. mollissima, C. crenata, C. sativa, C. seguinii* and *C. pumila*. *C. henryi* has proved to be incompatible with *C. mollissima* but it is hoped that the *C. henryi* x *C. pumila* hybrids obtained in 1955 may be compatible with *C. mollissima* or *C. crenata*. Repeated crossing between *C. crenata* x *C. dentata* and *C. crenata* has resulted in the development of dwarf, male-sterile forms. Rapid vigorous growth has been shown by one specimen of *C. dentata* x *C. mollissima* but it is not resistant to *Endothia parasitica* and it produces sterile pollen. It has been back crossed to *C. mollissima* to improve its blight resistance. The BC_1 has now been crossed with both *C. dentata* and *C. mollissima* x *C. crenata*.

4414 *Gellatly, J. U. Tree hazels*—Corylus colurna. (*pp. 110–12*).
Considerable variation in respect of habit and winter hardiness has been observed in British Columbia among progeny of crosses between tree hazels and filberts.

4415 *Gellatly, J. U. Filazels.* (*pp. 112–14*).
A list is given of promising selections from crosses between filberts and hazels made in British Columbia.

4416 *McDaniel, J. C. The pollination of Juglandaceae varieties—Illinois observations and review of earlier studies.* (*pp. 118–32*).
The problem of dichogamy in species of *Carya* and *Juglans* is discussed in relation to breeding and nut production. A table is included showing the dates of pollen shedding and stigma receptivity of several varieties of the economically important species, at Urbana, Ill., in 1955 and 1956, together with detailed notes on the characteristics of these and other varieties.

4417 *Gerardi, L. American persimmon varieties and their desirability.* (*pp. 132–36*).
The characteristics of 42 varieties grown in the USA are described.

4418 *McDaniel, J. C. Nut germination observations, 1955–1956.* (*pp. 138–42*).
Data are included on the germination of unstratified nuts of varieties of *Juglans* and *Carya* spp. at Urbana, Ill., during the winter of 1955–6.

4419 Serr, E. F. & Forde, H. I.
Walnut breeding.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 184–94.
A detailed account is given of objectives, methods used and progress so far achieved in breeding *Juglans regia* at Davis, Calif. Observations on progenies from selfings and intervarietal crosses indicate that the inheritance of characters such as time of leafing, production of pistillate flowers, nut size, date of maturity and weight, percentage and colour of kernel depends upon many genes. Payne appears to be heterozygous except for genes controlling early maturity and tight seal of the nut. One selfed seedling of Payne has so far proved equal or superior to the parent variety in all the important characters studied; it may be of value as a commercial variety where very late leafing is not required, or as a parent. Leafing dates 14–21 days after Payne, combined with the production of pistillate flowers on lateral buds, may be obtained by crossing late-leafing varieties such as Franquette and Conway Mayette with Payne. Selfs of Hartley were inferior to the parent variety in total production of pistillate flowers. As a parent, Franquette has tended to depress nut size in the F_1. Payne carries recessive genes which cause dwarfing in some selfed seedlings.

4420 Harper, R. E.
Pecan varieties and breeding in New Mexico.
Proc. Tex. Pecan Grow. Assoc. 1956 : **35** : 37–39.
Comments are made on the performance of varieties. Breeding initiated five years ago has resulted in seedlings showing improvements in nut characters and earliness in the first season of bearing. The seedlings vary considerably in susceptibility to aphid injury of the foliage; seedlings derived from Onliwon and Moneymaker appeared to be resistant. Susceptibility to aphid increased with degree of pubescence. The varietal differences observed in liability to

zinc-deficiency disease suggest that scope may exist for breeding to lessen this defect.

4421 Pavlenko, F. A.
(Hazel).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 5 : 28–29. [Russian].

Mičurinec 82 [Mičurinist 82], Stepnoĭ 83 [Steppe 83] and Sovetskiĭ 86 [Soviet 86] were obtained by open pollination of a southern form, raised from seed in the Poltava province. They are hardy, drought resistant and productive of large nuts with an oil content of up to 63·23%.

4422 de Rosa, M.
La "Mortarella" ottimo nocciuolo dell'-Avellinese. **(Mortarella, an excellent hazel of Avellino).**
G. Agric. 1957 : **47** : p. 95.

The above-named Italian variety is derived from a natural hybrid between *Corylus avellana* and *C. maxima* and is described in detail in this popular article. It gives higher yields than other varieties and is resistant to cold and fungous diseases.

4423 de Rosa, M.
Le varietà di nocciolo e le esigenze dolciarie. **(Hazel varieties and the needs of the confectionery industry).**
G. Agric. 1957 : **67** : p. 179.

Varieties most suitable for use in confectionery are briefly described.

4424 Conagin, C. H. T. M.
O melhoramento do amendoim cultivado (*Arachis hypogaea* L.), por meio de cruzamentos. Técnica empregada. [**Breeding the cultivated groundnut (*A. hypogaea* L.) by crossing. Technique employed**].
Bragantia 1956 : **15** : 297–300.

The process of emasculation, which is effected between 16 and 18 hr. on the day before the flower opens, is described and illustrated; pollination is carried out between 8 and 9 hr. the following morning. By the use of the method described, 50 hybrids have been produced and some selections made in the F_2 and F_3 generations.

4425 Kumar, L. S. S., D'Cruz, R. & Oke, J. G.
A synthetic allohexaploid in *Arachis*.
Curr. Sci. 1957 : **26** : 121–22.

A fertile amphidiploid, forming 30 bivalents, has been obtained by treating the triploid hybrid of *A. hypogaea* x *A. villosa* var. *correntina* with colchicine.

4426 Guilhaumaud, Y.
La culture de l'arachide en Espagne. **(Groundnut cultivation in Spain).**
Oléagineux 1957 : **12** : 201–05.

A brief description of the principal Spanish varieties is included. It is mentioned that mass selection of these is in progress at the Valencia horticultural research station.

4427 Sharma, A. K. & Sarkar, S. K.
Cytology of different species of palms and its bearing on the solution of the problems of phylogeny and speciation.
Genetica 1957 : **28** : 361–488.

The results are presented of a detailed cytological study of 50 species of palms from 28 genera, using the technique described in *PBA*, XXVI, Abst. 79. The chromosome numbers of the species studied are listed, 19 having $2n = 36$, 22 having $2n = 32$, 6 having $2n = 28$ and 2 having $2n = 16$. A high degree of pollen sterility was observed and the relative role of apomixis and sexual reproduction in fruit formation has been investigated. Considerable variation from the normal somatic chromosome number was frequently found in root tips, though in dividing cells the number was never greater than the normal. The bearing of the results reported on speciation and evolution in the Palmae is discussed.

4428 Baldini, E. & Scaramuzzi, F.
Contributo allo studio delle cultivar di olivo da tavola. **(A contribution to the study of cultivars of the edible olive).**
Riv. Ortoflorofruttic. ital. 1957 : **41** : 136–79.

Detailed descriptions are given of 15 olive varieties grown at Florence and Pescia.

4429 Akamine, E. K. & Girolami, G.
Problems in fruit set in yellow passion fruit.
Hawaii Fm. Sci. 1957 : **5** : No. 4 : 3–5.

The degree of cross compatibility between different passion-fruit clones in Hawaii has been found to vary considerably. The clones C–37, C–77 and C–80 were almost completely incompatible with each other while C–39 was highly compatible and gave good fruit sets with all three other clones.

4430 Larsson, G.
En spontan *Rubus chamaemorus* - hybrid, den första på den skandinaviska halvön. **(A spontaneous hybrid of *R. chamaemorus*, the first to be found on the Scandinavian peninsula).**
Bot. Notiser 1957 : **110** : 282–83.

Material from Storlien, Jämtland, Sweden,

earlier described as a form of *R. chamaemorus*, has proved to have $2n = 35$. It is suggested that it derives from a cross of *R. chamaemorus* ($2n = 56$) with *R. idaeus* ($2n = 14$), which occurs in the same neighbourhood, but the possibility of *R. arcticus* ($2n = 14$) being the diploid parent is not ruled out.

4431 Britton, D. M. & Hull, J. W.
Mitotic instability in *Rubus*.
J. Hered. 1957 : **48** : 11–20.

Twenty-eight mitotically unstable blackberry seedlings were found among the progenies of the following: (4*x*) Eldorado selfed; (8*x*) Austin Thornless x (8*x*) Eldorado; (*ca.* 8*x*) Johnson x (8*x*) Eldorado; (*ca.* 6*x*) wild seedling x (8*x*) Eldorado; (7*x*) Young x (8*x*) Eldorado; (8*x*) (Merton Thornless x Brainerd) selfed; (8*x*) (Merton Thornless x Brainerd) x (8*x*) Eldorado; (9*x*) Cascade x (8*x*) Eldorado; (7*x*) Boysen x (8*x*) Eldorado; and (4*x*) Hailsham raspberry x(8*x*) Austin Thornless. The instability involved a reduction in the $2n$ number which in a few cells of some plants was diminished to less than the gametic complement of either parent. The essential feature of the mechanism of this diminution was the grouping of the chromosomes of one cell into two plates, each with its own spindle at metaphase. Root cuttings of the unstable material gave rise to plants differing in phenotype and mitotically stable, with low chromosome numbers. Leaf-bud cuttings produced individuals phenotypically similar to the mother plant and perpetuated the instability. The difference between the two types of cutting are explained in terms of the contrasting histogenesis of the roots and shoots. The problem of mitotic instability in maintaining polyploids in breeding is discussed.

4432 Hull, J. W. & Britton, D. M.
Early detection of induced internal polyploidy in *Rubus*.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 171–77.

Plants or sectors with a colchicine-induced polyploid L–2 histogenic layer were consistently identified in a wide range of *Rubus* material by examination of the leaves with transmitted blue light, which strongly accentuates a number of distinctive characters.

4433 Larsson, G.
Tetraploid *Rubus arcticus*, framställd genom colchicinbehandling. **(Tetraploid *R. arcticus* induced by colchicine treatment).**
Bot. Notiser 1957 : **110** : 151–59.

Two tetraploids ($2n = 28$) induced by colchicine treatment of seeds of diploid material ($2n = 14$) are characterized by larger, more deeply serrate leaves, longer stomata, bigger pollen grains and larger but fewer drupelets than the diploid. One of the tetraploids has yielded a triploid ($2n = 21$) on being crossed with *R. stellatus* ($2n = 14$).

4434 Kuminov, E. P.
(Perpetual raspberries).
Agrobiologija (Agrobiology) 1956 : No. 5 : 148–49. [Russian].

Breeding work on wild local forms of *Rubus idaeus* sspp. *vulgatus* and *melanolasius*, all characterized by perpetual habit, at Minusinsk is mentioned. The perpetual habit is attributed to adaptation to the severe climate of the Krasnojarsk territory.

4435 Drain, B. D.
Inheritance in black raspberry species.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 169–70.

Investigations in Tennessee show that progenies from crosses of *Rubus albescens*, *R. crataegifolius* and an unidentified species with *R. occidentalis* and back crosses may be expected to bear fruits with larger seeds, heavier bloom, less juiciness, more acidity, greater firmness and more pronounced reddish blackness than the *R. occidentalis* progenies referred to in an earlier paper (cf. *PBA*, XXIII, Abst. 2973). Selections have been maintained for some years but they all show cold injury. Besides being productive and vigorous, they are somewhat longer living than varieties such as Logan and Bristol.

4436 Martakov, A. A.
(An evaluation of varieties and methods of making dessert wines from raspberries).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1957 : No. 2 : 18–23. [Russian].

Novostj Kuzjmina [Kuzjmin's Novelty] received the most points of the raspberry varieties tested for their wine-making properties at the Talgar Field Research Station, Kazahstan. It outyields Tehas, a hybrid between raspberry and dewberry, which was rated as the second best.

4437 Kuzjmin, A. Ja., Čuvašina, N. P. & Žironkin, I. M.
(The first tetraploid plants in the genus *Ribes*).
Agrobiologija (Agrobiology) 1956 : No. 5 : 108–13. [Russian].

Anatomical, morphological and phenological

descriptions of the tetraploid referred to in Abst. 2214 are given.

4438 Brightwell, W. T.
A comparison of the Ethel and Walker varieties as parents in blueberry breeding.
Diss. Abstr. 1956 : **16** : Publ. No. 18,778 : p. 1986.

Characters of the plant, fruit cluster and fruit were investigated in crosses of *Vaccinium ashei* 'Ethel' and 'Walker' with *V. ashei* 'Callaway,' 'Myers' and '11–180', a selection of *V. constablaei* x *V. ashei* and BM22 (*V. australe*) (cf. *PBA*, XXVI, Abst. 1778). Ethel is considered superior to Walker since the progenies of crosses in which it was involved had on the average higher yields per plant, larger and lighter-blue berries and a higher proportion of plants bearing berries with a small dry scar.

4439 Darrow, G. M.
Blueberry growing.
Fmrs'. Bull. Dept. Agric. Wash. 1957 : No. 1951 : Pp. 33.

Descriptions are included of varieties of the six species of *Vaccinium* grown in the United States.

4440 **New blueberry yields total crop at once.**
Bett. Fruit 1957 : **51** : No. 9 : p. 24.

A new blueberry variety, developed by H. E. Drew, Gate, Thurston County, Washington, has been named Gem. It is said to ripen all its crop within two or three days, to retain the ripe fruit on the bushes for at least two weeks and to be winter hardy and disease resistant.

4441 Reid, R. D.
Strawberry breeding at Auchincruive.
Sci. Hort. 1955–56 : **12** : 140–46.

The breeding programme at Auchincruive, Scotland, is outlined with reference to methods of testing for resistance to *Phytophthora fragariae*, the main fruit and vegetative characters sought, the problem of June yellows, and the new varieties developed, of which Talisman is the first to be released.

4442 Konstantinov, P. K. & Oljhovskiĭ, M. K.
(The best strawberry varieties in the Polesje and the woody steppe zone of the Ukraine).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 2 : 50–52. [Russian].

Korallovaja 100 [Coral 100] and Hybrids 29, 65 and 121 from the Ukrainian Horticultural Institute outyield the old standards and surpass these in fruit quality. Mention is made of Kievskaja Rannjaja 2 [Kiev Early 2] previously bred at the institute; it has finer flavour than Roščinskaja and Mysovka [Bay] and ripens a week earlier.

4443 Lazareva, A.
(New strawberry varieties in the Krasnodar territory).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 2 : p. 41. [Russian].

Among the new productive varieties with a pleasant flavour bred at the Maĭkop Research Station of the Institute of Plant Industry (MOSVIR) are Rannjaja Mosvir [Early Mosvir] and Černobrivka [Black Brow], both hybrids between Indian and Premier. They produce fruits weighing up to 12 g. and are early and tolerant of drought and fungi.

4444 Velikanova, E. V.
(An attempt to produce fertile hybrids between cultivated and wild strawberries).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 102–06. [Russian].

Seeds of the hybrids treated with 0·05–0·2% solutions of colchicine gave rise to 102 seedlings, of which 5 appeared to be polyploids. They were distinctly more frost resistant than the cultivated strawberry. Several of them showed various floral defects and impaired fertility but one seedling was hermaphrodite and bore normal flowers, pollen and fruits; 170 g. of fruits were produced per plant and they are described as long, handsome and good in flavour, with the aroma characteristic of the wild strawberry, and free from fungal infection.
Another seedling had both diploid and tetraploid tissue; the flowers on the diploid sector were sterile, those on the tetraploid sector gave rise to fruits which in flavour were superior to those of the other tetraploid; this hybrid was however less resistant to fungous diseases.

4445 Berendeĭ, A. E.
(Changing the inheritance of strawberry hybrids under the influence of mentors).
Agrobiologija (Agrobiology) 1956 : No. 6 : 59–62. [Russian].

Heritable changes were obtained in hybrids of Muto x Laxton's Noble and 100 x Muto raised in the Ukraine by training these on such stocks as Kievskaja Rannjaja 2 [Kiev Early 2] and other strawberry varieties. The changes involved morphological characteristics of the vegetative and reproductive organs, including an instance of abnormal flowers, and such

economic characteristics as growth period, yield, and size, shape, flavour and colour of the fruit. The extent of the influence of the mentor variety upon the hybrid depended on the variety used as mentor, the age of the hybrid scion and the length of the period during which it was subjected to mentor influence. Some material with desirable economic and biological characteristics was selected.

4446 Gopalan Nayar, T., Samuel Sundararaj, J. & Seshadri, V. S.
Nanguneri Peyan variety of banana—its culture and taxonomical status.
Indian J. Hort. 1957 : **14** : 24–29.

The above cooking variety, also valued in Madras for its large leaves, is described and it is suggested that it should be regarded as a variety of *Musa balbisiana*.

4447 Lazarevskiĭ, M. A.
(Methods for clonal selection of the vine).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 8 : 27–31. [Russian].

An article by Soldatov (cf. Abst. 3456) is criticized. Instances of clones having been selected with a different growth period or colour of berry but otherwise indistinguishable from the initial variety are cited and it is thought that in the same way, clones constant with regard to high yield can be obtained. Soldatov's claim that bud mutations are the main source of valuable clones is not borne out by the writer's own research in the Caucasus and the Crimea, where most mutants possessed some undesirable characters.

4448 Zotov, V. V.
(Improving the standard varieties of vine by selection).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 8 : 31–35. [Russian].

While accepting Soldatov's claim that many valuable varieties have been obtained by selection of vegetative mutants (cf. Abst. 3456), the writer insists upon the need for improvement of existing varieties by selection of high-yielding and vigorous clones.

4449 Košeljnik, I. I.
(Change the method of mass selection).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 8 : 35–36. [Russian].

This account of clonal selection of vines in Moldavia forms the basis for a critical discussion of the official instructions on mass selection. Observations on productive clones of a series of varieties showed that the character of yield is heritable.

4450 Negrulj, A. M.
(For greater consideration of clonal selection of the vine).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 8 : 37–39. [Russian].

The writer concludes the discussion stimulated by Soldatov's article with observations along the same lines as Zotov and Lazarevskiĭ (cf. Absts. 4447–8).

4451 Dalmasso, G.
Viti e vini nel Paese del Sol Levante. **(Vines and wines in the Land of the Rising Sun).**
Ital. agric. 1957 : **94** : 401–12.

The vine-growing and wine-producing industries of Japan are discussed, mention being made of the origin and characteristics of the varieties grown.

4452 de Lattin, G.
Zur Genetik der Reben. Bisherige Ergebnisse der Faktorenanalyse bei der Gattung *Vitis*. **(Vine genetics. Results up to date of factorial analysis in the genus *Vitis*).**
Vitis 1957 : **1** : 1–8.

The relatively few characters whose genetic behaviour has been accurately studied are enumerated and a table is given of the results, symbols being allotted to 53 genes, 48 of which are independent and 6 multiple allelomorphs. Only one case of linkage has been established. Some genes affect more than one character and it is pointed out that in some cases one of the characters concerned may be of importance in affecting viticultural characters or wine quality though the others are purely morphological.

4453 Durquety, P. M.
Note sur la génétique des anthocyanes des raisins. **(Note on the genetics of grape anthocyanins).**
Progr. agric. vitic. 1957 : **74** : 309–15.

The genetics of anthocyanin pigmentation has been studied in numerous crosses involving French and American varieties. It is suggested that two gene pairs may be involved, *G g* (diglycosides *v.* monoglycosides) and *O o* (triphenols *v.* diphenols). Vines of the *vinifera* type would be of genetic constitution *ggOO*, *riparia* types, *GGOO*, and *aestivalis* types, *ggoo*. (Cf. *PBA*, XXVI, Abst. 1800).

4454 Patel, G. I. & Olmo, H. P.
Interspecific triploid hybrid in grape.
Caryologia 1957 : **9** : 340–52.

A triploid grape with $2n = 59$, designated RX45–3, has been produced in North Carolina by back crossing RX41–1 [(*Vitis lincecumii* - *V labrusca* - *V. vinifera*) x *V. rotundifolia*] to Hunt, a male sterile variety of *V. rotundifolia*. Chromosome pairing in RX45–3 was found to be very irregular, the average configuration being $18{\cdot}1_{I}$, $15{\cdot}0_{II}$, $2{\cdot}2_{III}$, $0{\cdot}9_{IV}$, $0{\cdot}14_{VI}$ and 0·7 fragments, and postmeiotic irregularities were frequent. When RX45–3 was used as the pollen parent in a cross with *V. vinifera* 'Hunisa' a few seeds of varying sizes were obtained but with *V. rotundifolia* 'James' and 'Stuckey' no seeds were set. The triploid is vigorous and disease resistant, resembling *V. rotundifolia* in leaf, tendril and bark characters and is expected to be of value in breeding.

4455 Patel, G. I. & Olmo, H. P.
Induction of polyploidy in the sterile F_1 hybrids of *Vitis vinifera* Linn. and *Vitis rotundifolia* Mich. x.
Phyton 1956 : **7** : 63–68.

Colchicine treatment of F_1 hybrid seedlings of *V. vinifera* x *V. rotundifolia* (cf. *PBA*, XXV, Abst. 2382) has given a number of polyploid plants which were recognized by their increased stomatal size. It is hoped that these polyploids may be of use in the development of new root-stocks because of their increased vigour.

4456 Einset, J.
Wanted . . . a better Concord grape.
Amer. Fruit Gr. 1956 : **76** : No. 10 : 7, 15.

Attempts made at the New York State Agricultural Experiment Station to develop a variety with all the desirable characters of Concord but ripening 2–4 weeks earlier are described. In view of their failure, treatment with X rays, γ rays and thermal neutrons has been applied on a large scale to the variety, although it is expected that most of the mutants induced will be similar to those occurring spontaneously.

4457 Constantinescu, G. & Negreanu, E.
Apariţia de caractere noi la viţa de vie sub influenţa mentorului-portaltoi. **(Appearance of new characters in the vine under the influence of mentor stocks).**
Bul. şti. : Sect. Biol. Şti. agric. 1956 : **8** : 657–66.

Various changes, in particular a higher sugar content, were noted in the scions of vine hybrids grafted on Riparia x Rupestris 3309 and Berlandieri x Riparia Teleki 8B as compared with the ungrafted controls.

4458 Rande, B.
Le Négret de la Canourgue.
Progr. agric. vitic. 1957 : **74** : 289–94.

A description is given of the above variety, a local form grown in the department of Lozère.

4459 Reggiani, F.
Una nuova varietà di uva da tavola: l'Anna Maria (U.n.4). [**A new dessert grape variety: Anna Maria (U.n.4)**].
Frutticoltura, Bologna 1956 : **18** : 259–65.

This new, early, Italian variety is described as possessing all the desirable characters of its parents, Csaba Pearl and David. It produces medium-sized bunches of amber-yellow grapes which are not damaged by handling during packing and transport and it is expected to become popular for export as well as for home consumption.

4460 Mercuri, S.
La Clotilde Prosperi. Uva da tavola eccellente. **(Clotilde Prosperi. An excellent table grape).**
Ital. agric. 1957 : **94** : 274–76.

A further description of this recently developed variety is given (cf. Abst. 2228).

4461 Del Gaudio, S. & Giusto, D.
"Impigno".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : clix–clxiv.

The grape variety described here, which is grown only in the hills around Brindisi, produces green berries used for making a good, dry white wine.

4462 Del Gaudio, S. & Giusto, D.
"Francavidda".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : clxv–clxx.

Francavidda, from the province of Brindisi, produces amber grapes from which a good quality white wine is made.

4463 Del Gaudio, S. & Giusto, D.
"Susumaniello".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : clxxi–clxxv.

The description given here is of a clone growing at the vineyard of the Society for Vine-growing at Brindisi. The grapes are used for wine making and are also mixed with others to add colour to the wine.

4464 Cosmo, I. & Polsinelli, M.
"Cabernet franc".
Ann. Sper. agr. 1957 : **11** : No. 2 : Suppl. : ccxiii–ccxxii.

This French vine, described from a clone in the

collection of the Experimental Station for Vine Growing and Wine Making, Conegliano, bears bluish-black grapes from which an excellent red wine is made.

4465 Cosmo, I. & Polsinelli, M.
"Merlot".
Ann. Sper. agr. 1957 : **11** : No. 2 : Suppl. : ccxxiii–ccxxxiv.
The vine described, introduced into Italy from the Gironde, gives good yields of yellowish-pink grapes from which a red wine is made.

4466 Cosmo, I. & Polsinelli, M.
"Negrare". (**Negrara varieties**).
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : cclxiii–cclxxii.
Three varieties are described here: Negrara Trentina, a dark blue-violet grape, used only for wine-making, grown in the provinces of Trento, Bolzano and Verona; Negrara Veronese, a similar grape grown in Vicenza and Verona; and Negronza, a dark blue-black grape grown in Verona for wine making but not of much importance.

4467 Cosmo, I. & Polsinelli, M.
"Lagrein".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : cclxxiii–cclxxx.
This blue-black grape, used exclusively for wine-making, is widely grown in the province of Bolzano.

4468 Cosmo, I. & Polsinelli, M.
"Teroldego".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : cclxxxi–cclxxxix.
The variety described here is grown in the provinces of Pisa and Trento and produces blue-black grapes used for wine-making.

4469 Cosmo, I. & Polsinelli, M.
"Ribolla gialla". (**Yellow Ribolla**).
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : ccxci–ccxcviii.
This yellow grape variety, grown in Gorizia and Udine, is exclusively used for wine-making, giving a light straw-coloured wine.

4470 Cosmo, I. & Polsinelli, M.
"Durella".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : ccxcix–cccvi.
The variety described here, a yellow grape used only for wine-making, is grown in the provinces of Vicenza and Massa Carrara.

4471 Cosmo, I. & Polsinelli, M.
"Fogarina".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : cccvii–cccxiv.
The blue-black grape described here is grown throughout the province of Reggio Emilia for the production of a dark red wine.

4472 Cosmo, I. & Polsinelli, M.
"Corvine veronesi" e "Corbina vicentina". (**The Corvina veronese varieties and Corbina vicentina**).
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : cccxv–cccxxxvi.
Several varieties are described: Corvina veronese, a blue-violet grape giving a dark red wine, grown in Verona; Corvinone veronese, differing only slightly from the preceding variety; Corvina gentile, characterized by sparse bunches; Corvina rizza, with smaller leaves; and Corbina vicentina which produces blue-black grapes used for wine-making and which is grown only in the province of Vicenza.

4473 Bruni, B.
"Girò".
Ann. Sper. agr. 1957 : **11** : No. 3 : Suppl. : cccxxxvii–cccxliv.
The grape variety described here produces blackish-purple fruit from which a high quality ruby-red dessert wine is made and is grown in the Sicilian provinces of Cagliari, Sassari and Nuoro.

4474 Plumier, M. W.
Déterminations chromosomiques et cultures de pollen chez quelques variétés de raisins de table. (**Chromosome determinations and pollen culture in some dessert grape varieties**).
Bull. Off. int. Vin 1955 : **28** : 1–6.
Chromosome determinations made from squashes of young leaves are reported for 22 varieties together with information on percentage germination of the pollen and size and shape of the pollen grains. With the exception of three varieties, all had $2n = 38$. Of the three aberrant types, Léopold III and Cannon Hall had mostly tetraploid cells ($2n = 76$) and a few diploid cells, while in Muscat d'Alexandrie the reverse was true. Root-tip counts gave $2n = 38$ for the last-named and $2n = 76$ for Cannon Hall. Pollen mother-cell meiosis in Léopold III showed $2n = 76$. To account for the different numbers in the leaves it is suggested that these varieties are chimeras.

4475 Avramov, L.
Prilog poznavanju autogamnog oplodjavanja kod nekih sorti vinove loze gajenih u ekološkim uslovima NR Srbije. (**Contribution to the study of autogamic fertilization of some vine varieties cultivated under the ecological conditions of the People's Republic of Serbia**).
Arh. poljopr. Nauk. 1956 : **9** : No. 26 : 41–58.

Bagging experiments with perfect-flowered varieties from different districts of Serbia showed that Mirkovača, Prokufac and many others are self fertile. Some other varieties are male sterile.

4476 Geisler, G.
Die Bedeutung des Wurzelsystems für die Züchtung dürreresistenter Rebenunterlagssorten. (**The importance of the root system for breeding drought-resistant rootstock varieties**).
Vitis 1957 : **1** : 14–31.

A number of seedlings of known reaction to drought were classified according to their root systems. In the crosses Ob.595F_1 x Riesling and G157 x Riesling correlation coefficients of —0·661 and —0·597 respectively were obtained between root type and drought resistance, the more resistant seedlings being those with deep, relatively unbranched roots. A similar correlation was observed in examining the roots of a number of varieties differing in drought resistance. A correlation of —0·706 between root branching and shoot branching was observed and it is suggested that selection for low degree of branching in the vines should lead to increased drought resistance. Some of the seedlings, especially in crosses with Riesling, had deeper roots than were found in any of the parents. The seedlings also differed in the rate at which roots were formed in the early growth period; in some crosses this character was correlated with drought resistance but in others it was not.

4477 Wagner, E.
Über das Auftreten von Pollenkörnern mit abnormer Keimporenzahl bei der Weinrebe. (**The occurrence of pollen grains with abnormal number of pores in vines**).
Vitis 1957 : **1** : 9–13.

Pollen grains with 2 or 4 pores instead of the usual 3 were observed in *Vitis vinifera* 'Riesling' and 'Sylvaner' after treatment with cold at the time of pollen meiosis. The grains with 4 pores were mostly larger than normal and were diploid, those with 2 had less than the normal chromosome number and were inviable.
Similar abnormalities were observed in F_3 seedlings from *V. vinifera* x *V. riparia* without treatment and to a more pronounced degree after heat treatment. Tetraploids of *V. vinifera* all had a large number of pollen grains with 4 pores and some also with 5 and even 6.

4478 Wellington, R.
Seedless grapes for the East.
Amer. Fruit Gr. 1956 : **76** : No. 10 : p. 22.

Four of the many seedless selections developed at the New York State Agricultural Experiment Station are briefly described: Interlaken Seedless, Himrod Seedless, Romulus Seedless and New York Seedless 15302. All were selected from Ontario x Thompson Seedless and bear white fruits. Himrod Seedless (cf. *PBA*, XXIII, Abst. 1473) and Interlaken Seedless are very early in ripening, with outstandingly good quality. Their productiveness has so far been rated as fair. Romulus Seedless (cf. *loc. cit.*) is a productive mid-season variety, bearing large compact clusters of small berries. New York Seedless 15302 ripens late, producing unusually large clusters of medium-sized berries. It shows some seediness but not to an objectionable degree.

4479 Mitović, D.
Sadržina šećera i kiseline u širi gajenih sorata vinove loze u Metohiji. (**The sugar and acid contents of the must of the vine varieties cultivated in Metohija**).
Arh. polkopr. Nauk 1956 : **9** : No. 23 : 87–92.

High quality musts were obtained from red wine varieties such as Game Crni [Black Gamay], Burgundac Crni [Black Burgundy] and Alicante Bouschet. Mention is also made of good dessert varieties with a sugar content of 20–25%.

4480 Capucci, C.
Possono portare germogli fertili i polloni pedali delle viti danneggiate dal freddo? (**Can the rootstocks of vines damaged by cold carry fertile buds ?**).
Frutticoltura, Bologna 1957 : **19** : 132–34.

Differences have been found between varieties in Italy in respect of their production of fruit-bearing shoots after frost damage. Sangiovese, Uva d'Oro [Golden grape] and Merlot among the black grapes and Maligia, Albana, Trebbiano romagnolo, Trebbiano d'Empoli and Ganganega among the white grapes showed good recovery from damage.

4481 Derkunskaja, M. D.
(Breeding work on a state farm).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 8 : 46–48. [Russian].
This account of breeding vines for hardiness in the Stavropolj territory mentions new varieties tolerant of −29·5° C. The best among them are Verbljudogorsk, Beštau, Madlen Morozostoikii [Frost-tolerant Madeleine], Sejanec Čudesnyï [Wonderful Seedling], Pervenec Laboratorii [First-born of the Laboratory], Uspeh [Success] and Suvorovec. All these had the hardy local wild vine in their parentage.

4482 Boubals, D.
Sur le comportement des vitacées à l'égard du mildiou de la vigne (*Plasmopara viticola* B. et C. Berl. et de T.) [**On the behaviour of the Vitaceae with respect to vine mildew (*P. viticola* B. et C. Berl. et de T.)**].
CR Acad. Sci. Paris 1957 : **244** : 1535–37.
Inoculation of isolated leaves with a conidial suspension gave rise to local peristomatal necroses in the resistant species *Cissus carnosa*, *C. quadrangularis*, *Vitis rotundifolia*, *V. rubra*, *V. riparia* and *V. rupestris* but not in the susceptible species *V. vinifera*. In the three first-mentioned species, which are the most resistant, mycelial growth ceased in the necrotic region. In the other resistant species, the fungal mycelium sometimes grew beyond the necrotic region and produced conidiophores, the number of instances in which this happened being inversely proportional to the resistance. It is suggested that the peristomatal necroses exert a fungitoxic influence on the pathogen.

4483 Boubals, D.
Sur le comportement du mildiou de la vigne (*Plasmopara viticola* B. et C. Berl. et de T.) lors d'inoculations de cultures de tissus de Vitacées. [**On the behaviour of vine mildew (*P. viticola* B. et C. Berl. et de T.) when used to inoculate tissue cultures of Vitaceous species**].
CR Acad. Sci. Paris 1957 : **244** : 1816–18.
Upon inoculation of tissue cultures of the stems of Vitaceous species, mycelium failed to develop on the resistant species *Cissus carnosa*, *Parthenocissus quinquefolia*, *Ampelopsis brevipedunculata* and *Vitis rotundifolia*, all of which react to leaf inoculation by the development of peristomatal necroses and failure to form conidiophores (cf. Abst. 4482). In less resistant species, some of which develop peristomatal necrosis, the amount of mycelial growth and conidiophore formation in the tissue cultures was in inverse relation to the resistance.

4484 Coutinho, M. C. P.
Notes sur le comportement hétérozygotique de la *"Vitis vinifera"*. **(Notes on the heterozygous behaviour of *V. vinifera*).**
Bull. Off. int. Vin 1955 : **28** : 67–69.
Progenies resulting from self fertilization or intraspecific hybridization varied widely in reaction to *Plasmopara viticola*, greatest variation being shown by the hybrid populations. It is concluded that the varieties studied were heterozygous with respect to factors determining downy mildew reaction.

4485 Boubals, D.
Amélioration de la résistance de la vigne au mildiou (*Plasmopara viticola* (B. et C.) Berlèse et de Toni). Recherche de géniteurs de résistance. [**Improvement of the resistance of the vine to mildew (*Plasmopara viticola* (B. et C.) Berlèse et de Toni). Research on resistant parents**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1956 : **6** : 481–525.
Extensive investigations on the mildew resistance of direct-producer hybrids are reported. Resistance was studied in respect of young leaves, mature leaves and berries, the resistance of the mature leaves providing the most useful index of varietal resistance. The resistance of selfed progenies of selected resistant parents was also investigated, the parents giving rise to the highest percentage of resistant offspring being the Seyve-Villard clones 18–315, 18–402, 23–18, 23–353, 23–501 and 23–510.

4486 Pioth, L. C.
Untersuchungen über anatomische und physiologische Eigenschaften resistenter und anfälliger Reben in Beziehung zur Entwicklung von *Plasmopara viticola*. **(Investigations on anatomical and physiological properties of resistant and susceptible vines in relation to the development of *P. viticola*).**
Z. Pflanzenz. 1957 : **57** : 127–58.
Conidiophores were found on all the vines tested when infection was carried out under optimum conditions; they were less frequent however on

resistant varieties. It was therefore concluded that resistance was not conditioned by stomatal factors preventing penetration. Mucilage cells, usually containing raphides, were more frequent in the susceptible vines in the early growth phases but in the later phases the resistant vines displayed an increase both in the number of mucilage cells and in susceptibility. Mucilage cells were also present in immune species such as *Ampelopsis brevipedunculata* and *Parthenocissus quinquefolia*.

The development of the fungal mycelium in the host tissue is described and illustrated, together with the formation of oogonia, antheridia and oospores.

Examination of the sap by paper chromatography showed that in the early growth phases the susceptible varieties contained appreciable quantities of an indole compound which was absent or present in lower concentration in the resistant varieties, in which it appeared only in the later phases when their resistance had also diminished. In the immune species *A. brevipedunculata* and *P. quinquefolia* it was absent altogether. Tests of the different saps on oat coleoptiles showed the indole compound to be a growth substance, and after administration of β-indoleacetic acid to immune species it became possible to infect them. On the other hand, administration of growth substance to susceptible vines increased their resistance. No difference between resistant and susceptible vines was detectable in respect of content of other organic acids, aminoacids, sugars or vitamin B_1.

A partially successful method of culturing the fungus *in vitro* is described; the presence of growth substances in the culture medium was shown to be necessary for fungal growth. It is tentatively suggested that the mucilage cells may be sites of accumulation of growth substances or other compounds necessary for the nutrition of the fungus.

4487 Hahn, H.
Eine Auslesemethode für die Resistenzzüchtung gegen den roten Brenner (*Pseudopeziza tracheiphila* Müller-Thurgau). (**A selection method for breeding for resistance to *Ps. tracheiphila* Müller-Thurgau**).
Vitis 1957 : **1** : 32–33.

By culturing the fungus in carrot juice or other liquid media and spraying, after dilution if necessary, on to the seedlings, good and reliable infections were obtained.

FORESTRY

Report on Forest Research for the year ended March, 1956 (1957) : Pp. 172.

4488 *Matthews, J. D. & Mitchell, A. F. Forest genetics.* (*pp. 54–58*).

Work in progress includes (1) a survey of existing woodlands and plantations in Britain in order to study the natural variation exhibited by each species, to locate the best seed sources for current planting programmes and to select outstanding individuals for use either directly or as parents in breeding work, (2) the production of clones from plus trees for inclusion in trials and collections and for direct use, (3) progeny testing of plus seed sources and testing of plus trees by clonal and progeny trials, (4) the formation of seed orchards of Scots pine, European larch, Douglas fir and beech and their use for further improvement, (5) the use of interspecific hybridization in larches and pines, (6) a study of the techniques of tree breeding and (7) a study of methods of controlling seed origin and quality.

4489 *Biggs, P. Studies on* Meria laricis *needle-cast disease of larch.* (*pp. 89–90*).

The presence of eight strains of *M. laricis* has been confirmed, four in the a group and four in the b group, but it is not known whether the strains are genotypically distinct or are aggregates. More than one strain can be isolated by the single spore method from one diseased tree.

4490 *Edwards, M. V. Third report on an investigation of 1931–32 into various races of European larch.* (*pp. 142–54*).

Tabulated data are provided on the heights and survival at five or six years of age and height at 16 and approximately 20 years of age of plantations of European larch grown from seed from two localities in Scotland, one from Silesia and one from Switzerland. Information is also included on time of leaf flushing, time of leaf fall and resistance to larch canker. In favourable sites the Scottish trees were only slightly more successful but in unfavourable sites they were considerably more successful than the European, showing over 90% survival as compared with 80% for the Silesian trees and 66% for the Swiss trees. Similarly on unfavourable sites the Scottish trees were taller than the European.

4491 Ovsjankin, V. N.
(Mičurinist ideas in forestry).
Latv. PSR Zināt. Akad. Vestis 1956 : No. 6 : 49–60. [Russian].

This survey on the breeding of forest trees in the USSR mentions some of the results contained in the report summarized in *PBA*, XXV, Absts. 551–69.

4492 Aljbenskiĭ, A. V.
(Methods of improving tree species).
Goslesbumizdat, Moskva-Leningrad, 1954: Pp. 210. [Russian].

This handbook on forest-tree breeding in the Soviet Union deals in the introductory chapter with the use of selective thinning in improving the temporary and hereditary properties of a forest and some of the characters that should be selected for are enumerated. Chapter 2 is devoted to introduction and acclimatization, reference being made both to successful and unsuccessful attempts to introduce species from one region to another in past years. The most important factors to be taken into account in making introductions are discussed; mean annual temperature sums, frost resistance, drought resistance and provenance of seed are all considered, since no single factor is decisive to the exclusion of all others.

The various characters that may serve to distinguish forms within forest-tree species are discussed in chapter 3 and it is pointed out that differences in habit and certain morphological features are often correlated with differences in yield or timber quality. The author accepts the Mičurinist viewpoint that many characters arising as ecological responses may become incorporated in the hereditary constitution of the race or species, as in the case of drought resistance in *Fraxinus viridis* and of many forms of pine tolerant of lime or salt and in this connexion again the importance of seed provenance is emphasized; reference is made to several successful pine plantations that have been made in the southern areas of the Soviet Union with seed obtained from certain more northerly areas, but not all northerly areas gave equally good results.

Methods of tending young plantings and of improving seed bearing are considered in chapter 4 and hybridization in chapter 5; a list is given of 14 genera in which natural hybrids have been observed frequently and 5 in which they have been reported occasionally; this last group comprises spruce, pine, raspberry, buckthorn and cranberry. Some of the species hybrids described by Koelreuter (referred to as a Russian botanist) and Burbank as showing hybrid vigour are referred to; the increased frequency of hybridization often observed after introduction of a species from one area to another is ascribed to the effect of changed environment. A number of interspecific hybrids described by Darwin, Burbank, Pjatnickiĭ and others are cited; the various floral mechanisms that favour cross pollination in nature are analysed and experiments are described in which self pollination reduced the proportion of seedlings that survived from 61·5% to 28·4% in elms. The height of the seedlings at the age of two years was not however reduced. Good seedlings have been obtained from open pollination between the Siberian and European larch on the one hand and the Japanese on the other. If the properties of the species used as seed parent tend to predominate in the hybrids this tendency can, it is claimed, be reduced by using young plants of the seed parent or by pollinating cut branches placed in water; when crossing two species, both of them foreign to the area concerned, new characters not found in either of the parental species often appear in the hybrids, as is reported for hybrids between southern and Chinese forms of *Populus alba* var. *pyramidalis*, which had rounded leaves. The methods of raising the hybrids according to the Mičurin-Lysenko principles are outlined; chapter 6 gives information on how to perform hybridization, sexual and vegetative.

Each of the remaining twelve chapters is devoted to breeding a particular tree.

Conifers. The first group to be considered are the spruces of which ten species are said to grow in the Soviet Union; within the species variation occurs in rate of growth, time of flushing, time of flowering, shape of crown, type of bark and other morphological features, and in the properties of the wood. Crosses between the different species are generally successful and instructions are given for the production of hybrid seed, the hybrids recommended being those between species and forms differing widely in geographical distribution.

Three larch species grow in the Soviet Union; indications are given of the areas from which suitable seed can be obtained for planting in given localities. Some hybrids are referred to which flowered at the age of 5–6 years in Moscow; they gave germinating seeds after 9–10 years. Very few seeds were set on self pollinating and those that did mostly failed to germinate; by artificial cross pollination the seed set was increased by almost 100% and up to 85% of the seeds germinated. *Larix europaea* and *L.*

sibirica have given better results in the USSR than *L. dahurica* and *L. leptolepis*. Hybrids such as *L. sibirica* x *L. leptolepis*, *L. sibirica* x *L. europaea* and *L. europaea* x *L. leptolepis* have given yields exceeding those of the parents by 23–50%. At the age of 10–12 years they set seed freely and the second generation has also proved superior to the parents in growth rate. Hybrids can be produced by interplanting two species and removing the branches with the male flowers from one; *L. sibirica* x *L. europaea* hybrids are recommended for the forest and forest-steppe zones, *L. europaea* x *L. leptolepis* for the south-western Ukraine.

Pines and cedars are treated together. Several local forms and even subspecies of the common pine exist, e.g. *Pinus sylvestris* ssp. *lapponica*, ssp. *hamata*, ssp. *kulundensis* and ssp. *sibirica*; special mention is made of the Altaï form with a pyramidal crown. By selection, forms with early and late flowering and black, brown, light-coloured and spotted seeds have been isolated; selection according to germination energy has led to improvements in vigour and adaptation. Experiments in which seed of different provenance was sown have shown that local seed usually gave the best results and that introductions from more northerly areas were more successful than those further south; also that for zones with low rainfall it is essential to use seed from dry areas; forms capable of growing on moist saline soil have been found in Kazahstan, forms growing on saline sandy soils in Voronež and forms tolerant of lime elsewhere. Hybrids between northern and southern pines grown at Voronež did better than either parent and many interspecific hybrids produced at Moscow proved more vigorous in growth. Reference is also made to hybridization work with pines carried out in Germany and the USA. A brief report is given of the behaviour of a number of *Pinus* species introduced into the USSR from elsewhere; *P. banksiana* is inferior to *P. sylvestris* in growth but may be of value for crossing with it; the same applies to *P. murrayana* and *P. resinosa*; *P. pallasiana* and *P. austriaca* are useful for their resin content; *P. strobus* does well except in arid zones, where *P. ponderosa* and *P. eldarica* thrive better. Natural hybrids have been observed between *P. sylvestris* and *P. nigra* and *P. montana*.

Birch. Four species of birch grow in the USSR; the chief species are *Betula verrucosa* and *B. pubescens*, which are considered as better combined in one species *B. alba*, the former being an ecotype of dry and the latter an ecotype of moist habitats. Many forms varying in the colour and other characteristics of the bark are distinguished. Seed from selfing had a germination percentage of 16–30% compared with seed from cross pollination with 96%; the seedlings from cross fertilization between different forms or species were more vigorous and more resistant to leaf rust. Instructions are given for carrying out hybridization.

Oak. The main oak species in the USSR is *Quercus pedunculata*, of which a number of geographical forms are described. A warning is given against using acorns from oaks in low-lying places for planting in dry areas or at higher altitudes; they do, however, give good hybrids with other ecological forms. The physiological characteristics of *Q. pedunculata* are described and compared with those of other species and genera; in all oak woods examined there were individuals with vigorous, medium and slow growth and improvement can undoubtedly be effected by selecting the vigorous ones. The floral biology of the oaks is such that cross pollination, even between species, can take place easily and the work of S. S. Pjatnickiĭ in producing hybrids artificially in the USSR is referred to, the most promising combinations being *Q. macrocarpa* x *Q. alba* and crosses of *Q. macranthera* with *Q. alba*, *Q. rubra*, *Q. macrocarpa* and *Q. pedunculata*; the last hybrid, known as Vysockiĭ's oak, is extremely drought resistant and vigorous and has a transpiration rate almost 50% below that of *Q. pedunculata* in dry weather. Of all the exotic species tried in the Soviet Union, *Q. rubra* has proved the best in the northern half where drought is not a problem.

Elm. Of the 30 species of the Ulmaceae that grow in the Soviet Union the most important are the elms. Self pollination reduced the germinating capacity of the seeds from 26·7 to 8·6% in the common elm. Hybrids between the small-leaved elm and the common elm and *Ulmus densa* were more vigorous than the parents and showed marked resemblances to the pollen parent; other hybrids between species tend to resemble the seed parent; among them, some forms resistant to Dutch elm disease have been found. The small-leaved elm from Central Asia is also comparatively resistant.

Maple. Hybrids have been produced between *Acer platanoides* and *A. negundo*, *A. negundo* and *A. dasycarpum* and between *A. tataricum* and *A. campestre*, *A. platanoides* and *A. negundo*. Mostly the hybrids resembled the seed parent but occasionally new characters appeared, such as hermaphrodite flowers in hybrids of *A. negundo* x *A. platanoides*.

Lime. Nine species of lime grow in the USSR,

the most important being the large and small-leaved limes. Hybridization between species is common and the hybrids usually do not segregate. The small-leaved Manchurian and Amur limes are frost-resistant.

Walnut. There are also nine native species of walnut. Experiments are cited in which heavier seeds gave rise to taller and more vigorous seedlings. *Juglans nigra* has proved the most drought resistant; this species, *J. cinerea* and *J. mandshurica* are also tolerant of frost in central Russia, *J. nigra* having survived—27·8°C. in 1948–9 and 1949–50. Large-fruited walnuts with thin skins, flowering at the age of 2–3 years, have been produced in Central Asia; other varieties bear twice a year. Hybrids of *J. nigra* with *J. mandshurica* and other species have been produced, the best results having been obtained by pollinating young trees. Some specially promising hybrids have been obtained from *J. regia* x *J. cinerea.*

Poplar. Among the many poplars the most drought resistant have proved to be *Populus alba, P. pyramidalis,* the Chinese poplar and some of their hybrids. Seed setting in the wind-pollinated diecious species such as the aspen has been increased by 3–14 times by supplementary artificial pollination. Several interspecific hybrids have occurred naturally and vigorous hybrids have been obtained artificially by crossing *P. alba* x *P. tremula* and *P. alba* x *P. bolleana,* the latter hybrid being frost resistant at Moscow. Other useful hybrids produced are *P. tremula* x *P. bolleana,* which has upright branches, *P. tremula* x *P. suaveolens, P. nigra* x *P. laurifolia, P. nigra* x *P. berolinensis* and *P. nigra* x *P. pyramidalis.*

Ash. The common ash, *Fraxinus excelsior,* is widely distributed in the USSR and many ecological forms of it exist. *F. mandshurica* and other species from the Far East are of interest for hybridization. No natural hybrids are known but artificially hybrids have been produced between *F. syriaca* snd *F. excelsior* and between *F. lanceolata* and *F. excelsior*; the latter hybrid showed strong resemblances to the maternal parent though in some plants the leaves resembled those of the common ash. A 30% lower transpiration rate has been observed in some of the hybrids compared with the parent species.

Bushes. The various bushes that have been the object of breeding operation include hazels, *Hippophae rhamnoides,* currants, willows, *Rhus cotinus,* and certain species such as *Robinia pseudoacacia,* quince and oleaster used for soil conservation.

4493 Selostus säätiön käytännöllisestä toiminnasta vuonna 1954. Metsäpuiden Rodunjalostussäätiö, Meddelanden No. 1. (**Report on the practical work of the foundation during 1954. Foundation for Forest Tree Breeding, Contribution No. 1**), Helsinki 1955 : Pp. 35.

Selection of plus trees of pine, spruce, larch and birch during the years 1947–54 is reported and of plus stands of spruce, pine, alder, curly birch and elm.

Poplar. Special emphasis has been placed on breeding the hybrid aspen *Populus tremula* x *P. tremuloides.* Crosses involving *P. grandidentata, P. canadensis, P. davidiana* and *P. maximowiczii* are being studied.

Birch. Pilot experiments in crossing native *Betula verrucosa* with *B. japonica* have been performed. Pollen of *Betula platyphylla* var. *japonica* from Japan is also being used for hybridization.

Alder. Crosses have been made between *Alnus glutinosa* and *A. rubra*; other crosses have been effected using *A. glutinosa* and *A. incana* as mother trees and *A. cordata* and *A. subcordata* as pollen parents.

Pine. Pilot experiments in crossing *Pinus peuce* and *P. monticola* have been carried out.

Spruce. Crosses between the plus tree E74 of *Picea abies* and selected plus trees of *P. jezoensis, P. glehnii* and *P. asperata* have been made.

4494 Hagman, M.
Selostus säätiön käytännöllisestä toiminnasta vuonna 1955. Metsäpuiden Rodunjalostussäätiö, Meddelanden No. 2. (**Report on the practical work of the foundation during 1955. Foundation for Forest Tree Breeding, Contribution No. 2**), Helsinki 1956 : Pp. 31.

Selection of plus stands of pine, spruce, alder, curly birch, oak, ash, elm and larch and of plus trees of pine, spruce, birch, aspen, oak, alder and larch is reported.

Poplar. *Populus tremula* x *P. tremuloides* crosses, obtained from parents from a number of different localities, are being studied. Hybrids involving *P. davidiana, P. maximoviczii* and *P. grandidentata* are showing good development.

Birch. Hybrids of *Betula japonica* x *B. verrucosa* have been obtained by open pollination.

Alder. Crosses have been made between *A. glutinosa* and *A. rubra.* Crosses made the previous year failed to set seed.

Pine. Crosses have been made as follows: *Pinus sylvestris* x *P. contorta, P. sylvestris* x *P.*

banksiana, *P. mugo* var. *arborea* x *P. sylvestris*, *P. mugo* var. *arborea* x *P. contorta*, *P. mugo* var. *arborea* x *P. banksiana* and *P. peuce* x *P. monticola*.

Spruce. The following crosses have been made: *Picea abies* x *P. jezoensis*, *P. abies* x *P. omorica* and *P. abies* x *P. sitchensis*. In addition crosses were made between forms of *P. abies* of different provenance. Earlier crosses of *P. abies* x *P. asperata* were successful.

4495 HAGMAN, M.
Selostus säätiön käytännöllisestä toiminnasta vuonna 1956. Metsäpuiden Rodunjalostussäätiö, Meddelanden No. 3. (**Report on the practical work of the foundation during 1956. Foundation for Forest Tree Breeding, Contribution No. 3**), Helsinki 1957 : Pp. 41.

Plus stands of pine, spruce, larch, birch, including curly birch, alder, oak, elm and ash have been recorded. Further plus-trees have been selected on the basis of growth, production and quality. Research on the selection of plus trees for pulp quality and chemical and morphological features has been carried out.

Field trials of pine, hybrid aspen, larch and poplar are in progress.

Poplar. Crosses between *P. tremula* and *P. tremuloides* have been made, also crosses involving *P. davidiana* and *P. maximoviczii*. The hybrid aspens have not been attacked yet by *Valsa nivea*, but whether this is due to actual resistance is not yet known.

Birch. Putative offspring of *B. japonica* x *B. verrucosa* have shown promising growth.

Pine. Many of the crosses made in 1955 failed to set seed. Crosses between *P. sylvestris* trees from different localities have been made, and others from selected plus trees. Crosses involving *P. murrayana*, *P. banksiana* and *P. montana* have also been made.

Spruce. The following interspecific crosses have been made: *Picea abies* x *P. jezoensis*, *P. abies* x *P. glauca*, *P. abies* x *P. mariana*, *P. abies* x *P. engelmanni*, *P. abies* x *P. omorica*, *P. omorica* x *P. jezoensis* and *P. omorica* x *P. glauca*. Seed obtained from crosses made in 1955 have been planted; the most successful cross was *P. abies* 'R_1' x *P. abies* 'R_3', which gave 46·7% germination.

4496 Trearkivet på Rødser gård et stort fremskritt for skogbrukets vekstforedling. (**The tree collection on the Rødser estate a great advance in forestry breeding work**).
Norsk Skogbruk 1957 : **3** : 166–68, 171–72.

In this report of an interview with R. Ruden, some of the activities of the tree-breeding section of the Norwegian Forestry Research Department are outlined. Work in progress includes: the selection and registration of plus trees of spruce, especially of *Picea abies* var. *columnaris*; the establishment of a tree collection on the Rødser estate; progeny trials of seed from open and controlled pollination of selected mother trees; investigations on techniques of vegetative propagation; crossings between various *Picea* species; crosses involving normal pine and spontaneous mutants with abnormal cell division, the aim being the production of triploids; and colchicine treatment and neutron irradiation of spruce and birch.

4497 BØRSET, O.
Skogtraernes arveegenskaper og skogskjøtselen. (**Hereditary characteristics of forest trees and forest management**).
Norsk Skogindustri 1954 : **8** : 97–102.

The importance of using good seed of suitable provenance and of grading plants and thinning and regenerating stands so as to retain the best genotypes is discussed. It is suggested that Norwegian woods may be improved through the use of spruces of German or other southern provenance, which show more vigorous growth than native races.

4498 BOUVAREL, P.
L'amélioration des arbres forestiers en Suède et au Danemark: rapport de mission, juillet 1953. (**Forest-tree breeding in Sweden and Denmark: report of a mission, July 1953**).
Ann. Éc. Eaux. For. Nancy 1954 : **14** : 153–220.

The matters dealt with in this review include: organizations concerned with forest-tree breeding in the two countries; selection methods and grafting techniques employed; progeny and provenance testing; establishment of seed orchards; and breeding by means of interspecific hybridization, induced mutation and spontaneous polyploids. Most of the work described has already been referred to in *Plant Breeding Abstracts*.

4499 VAN VLOTEN, H.
The development and organization of forest tree improvement in the Netherlands.
Euphytica, Wageningen 1957 : **6** : 14–17.

The development of forest-tree breeding, which was initiated in the Netherlands only after the second world war, is outlined.

4500 Hyun, S. K.
(Forest-tree breeding in Korea).
Chyung-ang Rim-ep Si-hem-yek Syu-uen Yuk-chyong Chi-yek T'euk Po/Pap. Suwon Inst. For. Genet. 1956 : No. 1 : Pp. 19 + 16. [Korean].

Poplar. Interspecific hybrids have been raised involving the following species: *Populus alba, P. davidiana, P. glandulosa, P. grandidentata, P. koreana, P. maximowiczii, P. monilifera, P. nigra, P. sieboldii, P. simonii, P. tremula* and *P. tremuloides.* A list of heterotic hybrids is given; the most outstanding was *P. monilifera* x *P. maximowiczii.*

Alder. Crossings involving *Alnus tinctorius, A. firma* and *A. japonica* are reported. Seeds of *A. sibirica, A. tinctoria* and *A. japonica* have been treated with colchicine to induce polyploidy.

Robinia. Seeds of *R. pseudoacacia* were treated with colchicine and 10·72% abnormal seedlings were obtained.

Pine. Plus stands of *Pinus densiflora* have been located. Hybridization involving *P. banksiana, P. densiflora, P. echinata, P. koraiensis, P. radiata, P. pungens, P. rigida, P. strobus, P. tabulaeformis, P. taeda* and *P. thunbergii* has been attempted. Special promise attaches to the hybrids *P. rigida* x *P. taeda* and *P. rigida* x *P. radiata.* Several species have been treated with colchicine to induce polyploidy.

4501 **Annual Report of the Department of Forestry, Union of South Africa, for the year ended 31st March, 1955** (1956) : Pp. 43.

The hybrids between *Pinus patula* and *P. oocarpa* which were raised at Cedara fall into two readily distinguishable groups. No obvious differences have been observed so far in the 375 plot experiment with the progeny of élite trees of *P. patula* at Border (cf. *PBA*, XXV, Abst. 2423).

4502 Boom, B. K.
Benaming, geschiedenis en kenmerken van een aantal houtachtige planten. **(Nomenclature, history and characteristics of some woody plants).**
Meded. Inst. Vered. TuinbGewass. 1957 : No. 97 : Pp. 124.

This list of cultivars of woody plants developed in the Netherlands during the past 20 years includes descriptions of the following new varieties and hybrids suitable for timber production: the *Fraxinus excelsior* varieties Doorenbos, Eureka and Westhof's Glorie; *Salix rubens* 'Drakenburg' (*S. alba* x *S. fragilis*), *S. alba* 'Liempde' and 'Rockanje'; and the Bea Schwartz elm resistant to Dutch elm disease. *Alnus elliptica*, a putative hybrid of *A. cordata* x *A. glutinosa*, is vigorous and has shown good wind resistance.

4503 Wright, J. W.
New chromosome counts in *Acer* and *Fraxinus*.
Morris Arbor. Bull. 1957 : **8** : 33–34.

The following chromosome numbers are reported: *A. buergerianum, A. cappadocicum, A. henreyi, A. macrophyllum, A. mayrii, A. negundo* and *A. platanoides*, $2n = 26$; *F. americana*, $2n = 46$ and *ca.* 92, *F. anomala, F. bungeana, F. latifolia, F. longicuspis, F. nigra, F. ornus, F. pubinervis, F. spaethiana* and *F. velutina*, $2n = 46$, *F. chinensis*, $2n = 92$, and *F. tomentosa*, $2n =$ ca. 138.

4504 Günzl, L.
Über die Standortsansprüche euro-amerikanischer Pappelsorten sowie der Graupappeln und Baumweiden. **(The requirements of the Euro-american poplar varieties and of *Populus canescens* and the tree willows as regards habitat).**
Allg. Forstztg. 1957 : **68** : 97–99.

A number of poplars that have arisen by hybridization between European poplars and species introduced from North America are referred to; recent observations have shown that the hybrids differ in the type of ground they are most suited to and indications are given of the habitats in Austria most suitable for *P. robusta, P. regenerata, P. gelrica, P. marilandica* and *P. serotina.* In areas of high altitude the most successful are *P. serotina* and two artificial hybrids referred to as T44 and T147. Some hybrids between local species, such as *P. alba* x *P. tremula*, are less exacting as regards growth conditions and are recommended for more unfavourable situations. Where conditions are too humid for these, some of the hybrid willows belonging to *Salix alba, S. rubra, S. fragilis* and *S. daphnoides* are recommended.

4505 Boom, B. K.
***Populus canadensis* Moench versus *P. euramericana* Guinier.**
Acta bot. neerl. 1957 : **6** : 54–59.

Reasons are given for concluding that *P. canadensis* Moench is the correct name for *P. deltoides* x *P. nigra.*

4506 Cepljaev, V. P.
(For the wide introduction of quick-growing and valuable forest trees).
Les. Hoz. (Forestry) 1957 : No. 6 : 35–40. [Russian].

Mention is made of important economic forms of deciduous trees and conifers found or bred in recent years in the USSR. They include interspecific hybrids of poplar from Central Asia, notable for their high rate of growth and good timber quality, and a giant form of *Populus tremula* which is resistant to *Ganoderma applanatum*.

4507 Orlenko, E. G.
(The principal forms of aspen in the forests of the White Russian SSR and their utilization in forestry).
Les. Hoz. (Forestry) 1957 : No. 5 : 7–11. [Russian].

A form of *Populus tremula* with green bark surpasses all others in resistance to heart rot (*Ganoderma applanatum*). A form with grey bark shows fair resistance in a pure stand on elevated ground and a form with a light-coloured bark is resistant only on one type of soil.

4508 Alekseev, I. A.
(A birch tree with dissected leaves).
Priroda (Nature), Leningrad 1957 : No. 4 : 115–16. [Russian].

A form of *Betula verrucosa* with leaves resembling those of *Acer platanoides* is reported from Voronež.

4509 Heybroek, H. M.
Elm-breeding in the Netherlands.
Silv. genet. 1957 : **6** : 112–18.

The breeding objectives are resistance to *Ophiostoma ulmi*, *Nectria cinnabarina*, frost and wind, rapid growth, attractive habit, freedom from epicormic shoots and suckers and timber quality. The Spanish seedling Christine Buisman is resistant to *O. ulmi* but susceptible to *N. cinnabarina*. The variety Bea Schwartz is resistant to both diseases but its habit is unattractive. Many hybrids have now been raised and special promise attaches to seedlings of the Huntingdon elm x *U. carpinifolia* '1' from France.

4510 Rovskiĭ, V. M.
(A radical method of controlling the Dutch elm disease).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1478–81. [Russian].

The opinion is expressed that the most effective way of controlling the damage to elms by *Ceratostomella ulmi* is to grow resistant forms. Species such as *Ulmus densa*, *U. androssowi* and *U. scabra* (= *U. glabra*), which grow in the Soviet territories of Central Asia, are all susceptible, though a certain number of seedlings with partial resistance have been selected after artificial infection. *U. pinnato-ramosa* however has proved completely resistant and promising hybrids have been produced by crossing it with the susceptible species; the hybrids combine resistance with rapid growth, handsome habit and other desirable qualities.

4511 Li, H.-L.
The origin and history of the cultivated plane-trees.
Morris Arbor. Bull. 1957 : **8** : 3–9.

This review of the origin and history of cultivated species of *Platanus* is mainly devoted to *P. orientalis* and *P. occidentalis*.

4512 Li, H.-L.
The origin and history of the cultivated plane-trees.
Morris Arbor. Bull. 1957 : **8** : 26–31.

The origin and variation of the putative hybrids between *Platanus orientalis* and *P. occidentalis* are discussed.

4513 Pryor, L. D.
Selecting and breeding for cold resistance in Eucalyptus.
Silv. genet. 1957 : **6** : 98–109.

The possibilities of improving the cold resistance of *Eucalyptus* for use in the Northern hemisphere are discussed. Clinal variations in growth, morphological characters and cold resistance in relation to latitude or altitude occur in many species, and in *E. pauciflora* such clinal differences have been shown to be heritable, indicating that selection would be effective. Pollination techniques are described. The degree of self fertility found in different species varies and outcrossing appears to be general, with interspecific hybrids occurring where species overlap in area. The species fall into groups within which the species are cross compatible but between which no interspecific hybridization takes place. Preliminary studies of hybrid combinations have shown that most of the morphological characters studied are multifactorially determined and display segregation and recombination. After an account of techniques of vegetative propagation which have met with some success, the article concludes with a suggested breeding programme following four main lines: (1) assessment of cold resistance of different species—a table showing the most

important species likely to contain frost-resistant material is presented; (2) provenance tests of stands growing in cold localities and of trees of good form from cold-resistant species; (3) progeny tests of natural hybrids of potential value for selection of recombinants—a table of promising natural hybrid combinations is included; and (4) artificial hybridization between good timber trees and cold-resistant species, suitable combinations being suggested.

4514 Khoshoo, T. N.
Meiosis in *Cephalotaxus drupacea* var. *pedunculata*.
Curr. Sci. 1957 : **26** : 118–20.

In 95% of the pollen mother cells of some trees meiotic irregularities were observed which were due to nonfunctioning of the spindle. The effect of environmental conditions is discounted as a cause of the functional derangement of the spindle, since trees with normal and abnormal meiosis grew in close proximity. Both normal and abnormal divisions occurred within the same pollen sac (cf. *PBA*, XXVI, Abst. 2857).

4515 Ehrenberg, C. E. & Simak, M.
Flowering and pollination in Scots pine (*Pinus silvestris* L.).
Medd. SkogsforsknInst. Stockh. 1956 : **46** : No. 12 : Pp. 27.

Artificial pollination experiments indicated that the female buds should be isolated before they open and that the optimum stage for pollination is when the young cones are fully expanded. It was possible to remove pollen from pollinated female flowers or to prevent it from germinating by dipping the shoots in water. Good cone sets were obtained on selfing, but the percentage of full seeds was markedly lower than in open pollinated cones. Mature cones without seeds or with empty seeds developed from both selfed and unpollinated young cones, showing that parthenocony occurs. The limited data obtained suggest that pollination stimulates cone development even in the absence of fertilization.

4516 Schütt, P.
Untersuchungen über Individualunterschiede im Schüttebefall bei *Pinus silvestris* L. (**Investigations into individual differences in incidence of needle cast disease in *P. silvestris* L.**).
Silv. genet. 1957 : **6** : 109–12.

In inoculation experiments with grafts from trees severely attacked by *Lophodermium pinastri* (negative trees) and from lightly attacked trees (positive), the positive grafts showed significantly less infection than the negative, suggesting that selection for resistance would be effective. No relationship between root development and incidence of the disease was observed.

4517 Šiškov, I. I.
(**The question of variability of spruce forms**).
Les. Hoz. (Forestry) 1957 : No. 5 : 13–15. [Russian].

A series of *Picea excelsa* forms at a forestry collective in the province of Leningrad are described. They showed differences in mode of branching. Forms referred to as long-crested and medium-crested possessed the most valuable economic characteristics; in particular they were superior in rate of growth, trunk shape, timber quality and resistance to damage by wind.

4518 Rubner, K.
Ergebnisse eines heute 20jährigen Fichtenherkunftsversuches. I. Teil. Die Fläche in Bayern. II. Teil. Die Flächen in Thüringen und Sachsen. (**Results of a 20-year-old provenance trial of spruce. Part I. The plantation in Bavaria. Part II. The plantations in Thuringia and Saxony**).
Silv. genet. 1957 : **6** : 65–91.

Of some 30 samples of spruce from Germany and neighbouring countries, planted in 1936 in plantations at different altitudes in Saxony, Thuringia and Bavaria, those originating from East Prussia and the Erzgebirge were good or excellent at all three sites. Other samples differed markedly in growth in the different trial areas.

4519 Bouvarel, P. & Lemoine, M.
L'expérience internationale sur les provenances d'épicéa (*Picea excelsa* Link.) [**International provenance trial of spruce (*P. excelsa* Link)**].
Silv. genet. 1957 : **6** : 91–97.

The results of a trial of 12 different spruces of different provenance planted in 1943 at Amance near Nancy are presented, details of height, flushing, late-frost damage and resistance to *Lygaeonematus abietinus* being given. The best growth in height was found in samples from about the same latitude as Amance and from the lower part of the altitudinal range of spruce. Trees of Balkan and Scandinavian provenance grew poorly. A high negative correlation was observed between early flushing and attack by *L. abietinus*.

4520 Haustov, Z. V.
(Concerning quick-growing spruce).
Les. Hoz. (Forestry) 1957 : No. 4 : p. 81. [Russian].

At the Siverskiĭ forest collective some trees had thicker and longer trunks than other trees of equal age. Seedlings raised from the quick-growing forms were more vigorous than those raised from other trees in the same environment and were conspicuously taller within a few years.

4521 Moskvitin, A. V.
(Two forms of spruce along the southern border of its habitat).
Les. Hoz. (Forestry) 1957 : No. 3 : 18–20. [Russian].

Two *Picea excelsa* forms occurring in the arid southern regions of Russia differ with regard to drought resistance. The drought-resistant form has vigorous, deep roots and is distinguishable from the other form by its habit, dark-green leaves, grey bark and red cones.

4522 Macenko, A. E.
(The specific separation of the Tien Shan fir).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1504–09. [Russian].

After a thorough study of this fir the author concludes that on cenological as well as morphological grounds it is distinct from *Abies siberica* and should remain as a separate species, *A. semenovii*.

4523 Krajina, V. J.
A summary of the nomenclature of Douglas-fir, *Pseudotsuga menziesii*.
Madroño, S. Francisco 1956 : **13** : 265–67.

The above epithet is regarded as the correct name of the Douglas fir, based on *Abies menziesii* Mirb.

VEGETABLES

Seventh Annual Report of the British Society for the Promotion of Vegetable Research, National Vegetable Research Station, Wellesbourne, 1956 (1957) : Pp. 80.

4524 *Haigh, J. C. Plant Breeding Report.* (*pp. 11–15*).

Red beet. Both early and late bolters in the F_2 of a cross between self-fertile, monogerm, late-bolting and poor-quality material derived from sugar beet and the red beet Detroit consisted of monogerm and multigerm types but early bolting and the multigerm condition were linked (Abst. 152). Late-bolting monogerm plants were back-crossed to Detroit. The few nonbolters in the F_2 are also to be back-crossed to Detroit. The progeny from the back cross of the F_1 of the above-mentioned cross to Detroit were all multigerm and early bolting; they were selfed to isolate double recessives combining the monogerm character with late bolting. A few nonbolting individuals of the globe type have been obtained from crosses of Detroit with long-rooted, nonbolting and and nonbleeding varieties and will be used in further breeding.

Onion. Hybrids between American male-sterile varieties and Cambridge lines showed a considerable degree of hybrid vigour, which was equalled in the progeny of crosses between cytoplasmically male-sterile plants and their fertile sisters within material developed at the station. The former hybrids were made in the course of transferring male sterility to Cambridge lines.

Cabbage. Plants selected from varieties found to be superior in previous trials were selfed and crossed in pairs as the initial step in breeding an improved dual-purpose spring cabbage.
Selection has failed to eliminate the rosette-type of head in winter cabbage. The inheritance of this defect is being investigated.

Cauliflower. In inbreeding to develop an even earlier strain, the S_1 of the early summer cauliflower Cambridge 5 gave encouraging results. No marked inbreeding depression was observed, as would have been expected from the self fertility of early summer cauliflower.

Brussels sprouts. Inbreeding is being effected in two ways. Part of the seed is sown in the glasshouse during August immediately after harvesting. The seedlings are given heat until the 10-leaved stage, after which they are kept in an unheated house until March. Heat is again provided so that flowering occurs in April. They are selfed, a further inbred generation being grown in the same year. This technique precludes selection but makes possible an assessment of the general effects of inbreeding. The remainder of the seed is sown in the normal way, with selection of lines in each generation.
S_3 lines of Cambridge Special, produced by the first method, had on the average 60% of the vigour of the original stock. Some hybrids between unselected plants from different S_2 lines gave a good performance, one combination giving 40% more marketable sprouts than the noninbred parent. A stock of Cambridge 3 produced by mass pollination of the best 16 plants out of 39 inbred plants gave 35% more marketable sprouts than the stock produced by mass pollination of the 39 individuals originally selected (cf. Abst. 152).

Self pollination of open flowers has not resulted in selection for self compatibility.
Male sterility is inherited as a simple recessive.
Lettuce. Plants without symptoms of mosaic occurred in the selfed progeny of F_2 selections of crosses referred to in Abst. 152. Inoculations are being made to determine whether the symptomless condition is due to tolerance or immunity. Wild *Lactuca* spp. are being collected for tests of mosaic resistance. The possibility of inducing a resistant mutant in Borough Wonder by irradiation is being explored.
The amount of natural crossing ranged from 0·15 to 11·52%, according to the time of flowering in successional sowings.

4525 *Holland, H. Classification and performance of varieties of red beet.* (*pp. 16–42*).
Two hundred and sixty-six varieties are classified into 9 main groups and 40 subsidiary groups. Data on yields in one year and bolting in two years are included. The value of the information obtained for planning breeding is indicated.

4526 *Nelder, J. A. Statistics report.* (*pp. 67–70*).
Activities included the continuation of a study of polygenic variation in flowering time and seed size in French-bean varieties. A nonadditive interaction has been observed in which the means for successive generations, instead of departing from the F_1 value and approaching the midparental value, approach the parent with late flowering time and small seeds. This effect, presumably the result of using material which has undergone considerable artificial selection, is being further investigated.
Factors causing differences in stand in yield trials of onion varieties are being investigated. After adjustment for differences in stand, different seed sources of the same variety showed significant disparities in yield. Genetic differences were detected in response to moisture conditions in the seed bed; this type of interaction could make adjustment to a constant stand a misleading method of analysis.

4527 Philipp, F.
Ergebnisse der Gemüsesortenversuche 1956, I. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of vegetable variety trials, 1956, I. (In connexion with the Commission for the Austrian Book of Cultivated Varieties)**].
Mitt. Klosterneuburg 1957 : **7** : 88–106.
Results of tests with varieties of lettuce, radishes and cucumber are reported.

4528 Müller, N.
Gemüsesaatgut—Neuheitenüberprüfung 1955/56 III. (**Vegetable seed—trials of novelties, 1955-56. III**).
Mitt. Klosterneuberg : Ser. B. : 1957 : **7** : 139–51.
Trials of new varieties of radish, French bean, tomato, egg plant and lettuce in Austria are reported.

4529 2e Jaarverslag. Proefstation voor de groenteteelt in de volle grond in Nederland. (**Second annual report. Experimental station for outdoor vegetable growing in the Netherlands**).
Alkmaar 1956 : Pp. 59.
In addition to varietal trials of strawberry, pea, endive, cucumber, celeriac, cauliflower and other vegetable crops, the following work was carried out:—
Potato. The breeding projects referred to in Abst. 193 continued.
Tomato. In breeding outdoor tomatoes for earliness and high quality, progenies from Moneymaker x Meteor and Moneymaker x Early North have shown promise.
Beans. A number of plants resistant to *Colletotrichum lindemuthianum* have been found among the progeny of crosses between French bean and *Phaseolus dumosus*. Imuna and Processor and various crosses involving one of these varieties have shown good resistance to stipple streak disease.

4530 Hastings, W. R.
The 1958 all-America winners.
Seed World 1957 : **80** : No. 5 : 8, 10–14.
The following five vegetable varieties have received All-America Selection medals for 1958:—
Ruby is a dark-red, non-heading salad lettuce with loose frilled leaves and is said to be less susceptible to tipburn than Prizehead.
A slow bolting mustard for use as a vegetable has been developed by N. V. Sluis en Groot, Enkhuizen, Netherlands. Named Green Wave, it has considerable drought and heat resistance and will stand longer than other varieties before going to seed.
The all-purpose snapbean Pearlgreen is mosaic resistant and produces stringless pods and white seeds. It is vigorous and more erect than Tendergreen and gives high yields.
The wax snapbean Choctaw and the beetroot Ruby Queen have been described in *PBA*, XXVI, Abst. 3847.

4531 Lamm, R., Hintze, S. & Åvall, H.
Klassificerande sort- och stamförsök med köksväxter 1954–1956. (Classificatory trials of varieties and strains of vegetables, 1954-1956).
Medd. Trädgårdsförs. 1957 : No. 106 : Pp. 28.

A list of all the varieties and strains awarded first class rank in the above trials, held at Alnarp, Sweden, is presented and includes the following new varieties. The broad bean Dreifach Weisse/56 [Triple White/56], developed from a cross between Weissbleibende von Holland [Holland Perpetual White] and the dwarf variety The Sutton, is moderate in yield but good in flavour and suitable for preserving. Immuna/56 is a very early, highly productive F_1 hybrid tomato resistant to *Cladosporium fulvum*. Its parents are a large-fruited American variety and a selection from Vetomold x Scania. Julia/56 (Dansk export [Danish Export] x Bonner Beste) is an early outdoor tomato. The marrowfat pea Servo/56 resembles Napo/52 in yield and earliness and is suitable both for canning and as a garden variety. Primex/56, from Primör x Norrlands express is the earliest approved sugar pea variety available The new cabbages Diplomat OE/56, developed by crossing and selection in Amager stenhuvud [Amager Stonehead], and Amager vintergrön OE/56 [Amager Wintergreen OE/56], from Amager stenhuvud x Amager hög [Amager Tall], both have good keeping quality, the latter being tall-stemmed and the former medium in height. The new celeriac Oden OJO/56 (1004 x Tellus) has a turnip-shaped rootstock with the roots confined to the extreme base, allowing easy harvesting.

4532 Banga, O.
Origin of the European cultivated carrot.
Euphytica, Wageningen 1957 : **6** : 54–63.

In an examination of ancient and modern literature, the author finds no evidence that *Daucus carota* ssp. *sativa* was known to the Romans, or to Europeans at the time of Charlemagne, when agriculture and horticulture were furthered by revival of the old Roman knowledge by the monks. He concludes that the initial material of the European cultivated carrot was imported from Arab countries round about the thirteenth and fourteenth centuries.

4533 Banga, O.
The development of the original European carrot.
Euphytica, Wageningen 1957 : **6** : 64–76.

Drawing upon the evidence from the literature and contemporary paintings and drawings, the author described the history of the European carrot. The initial material introduced from Arab countries consisted of the purple type, referred to as red by authors before the beginning of the eighteenth century, and a yellow type growing largely above the ground. The purple carrot was at first the main type cultivated but later the yellow type superseded it, probably from the sixteenth century onwards. The white and orange carrots were probably selected from the yellow type, "red" being used to describe orange carrots as the purple type diminished in importance. The first orange garden varieties were produced in the Netherlands. The evidence suggests that Late Horn and Half-long Horn were developed in the seventeenth century whereas Short Horn appeared in the eighteenth. Possibly Long Orange types for domestic use were produced in the Netherlands by selection of the long yellow carrot, perhaps after artificial or natural crossing with an unpalatable but more intensely coloured red-orange type. Brunsvic, an orange variety, probably came into use in Germany between 1684 and 1740; originally it had the characters of a forage carrot.

4534 Sampson, D. R.
The genetics of self-incompatibility in the radish.
J. Hered. 1957 : **48** : 26–29.

Self and cross incompatibility in *Raphanus sativus* 'Scarlet Globe' proved to be under the control of multiple oppositional *S* alleles. Pollen reaction was sporophytically determined. Five *S* alleles were detected in families derived from the three original self-incompatible plants used. Four acted fully and independently of each other in heterozygotes. The fifth was recessive in the pollen and incompletely recessive in the stigma when tested in the genotypes $S_1 S_5$ and $S_2 S_5$.

4535 Koncevoĭ, M. G.
(Some questions of breeding and seed production of the Mjačkovo onion).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 2 : 23–24. [Russian].

Measures designed to eliminate unwanted biotypes occurring in the above land variety from the Moscow province are discussed. Mjačkovo is valuable on account of its high yield, large bulbs, good keeping properties and agreeably sharp flavour. It is probably a hybrid of Kaba with Rostovskiĭ Repčatyĭ [Rostov Bulb].

4536 Erickson, H. T. & Gabelman, W. H.
The effect of distance and direction on cross-pollination in onions.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 351–57.

In investigations at the University of Wisconsin, Madison, use was made of circular plots in which pollen-fertile plants at the centre were surrounded by nine concentric rows of cytoplasmically male-sterile plants. The first circle was 1 foot away from the pollen source, the remaining rows being planted at 3-foot intervals. According to data on number of seeds per head, pollen dispersal was logarithmic with respect to distance. At 7 ft. away from the source, pollination decreased to approximately one-half of the maximum pollination, which occurred at a distance of 1 ft. The direction of pollen dispersal had no significant effect upon seed set. The data were inadequate for an evaluation of the influence of density of population upon pollen distribution.

4537 Hintze, S. & Åvall, H.
Försök med lök. (**Experiments with onion**).
Medd. Trädgårdsförs. 1957 : No. 105 : Pp. 19.

Hintze, S. & Åvall, H.
Försök med lök. (**Experiments with onion**).
Försök o. Forskn. 1957 : **14** : 54–55.

The results of local strain trials are presented. It is further reported that in experiments on spraying with 0·125, 0·25, 0·50 and 1·00% solutions of maleic hydrazide before harvesting, storage quality was markedly improved by the last three concentrations, later varieties of good keeping quality responding more favourably to spraying than early varieties.

4538 Håkansson, A.
Notes on the giant chromosomes of *Allium nutans*.
Bot. Notiser 1957 : **110** : 196–200.

Synergids containing large polytene chromosomes with a cable-like structure have been observed in the above species.

4539 Hasitschka-Jenschke, G.
Die Entwicklung der Samenanlage von *Allium ursinum* mit besonderer Berücksichtigung der endopolyploiden Kerne in Synergiden und Antipoden. (**The development of the ovule of *A. ursinum* with particular reference to endopolyploid nuclei in the synergidae and antipodal cells**).
Öst. bot. Z. 1957 : **104** : 1–24.

A detailed description is given of the development of the embryo sac and ovule in *A. ursinum* showing how the synergidae attain a high degree of polyploidy, one of them up to 16-ploid, to reach 32 and even 64-ploidy after fertilization has taken place. Diploidy, tetraploidy and up to 16-ploidy were observed in one of the antipodal cells. The structure of the chromosome in the highly polyploid synergidal cells is described and illustrated.

4540 Khoshoo, T. N. & Sharma, V. B.
Chromosome numbers of north Indian garlics.
Curr. Sci. 1957 : **26** : p. 62.

The most common type, having compound bulbs and small cloves, and another type with small simple bulbs are diploid ($2n = 16$). A type with compound bulbs and large cloves and another with large simple bulbs proved to be hexaploid ($2n = 48$).

4541 Hepler, P. R., Thompson, A. E. & McCollum, J. P.
Inheritance of resistance to *Puccinia asparagi* DC in *Asparagus officinalis* L.
Bull. Ill. agric. Exp. Sta. 1957 : No. 607 : Pp. 47.

Investigations referred to in Abst. 3512 are described in detail.

4542 Iizuka, M.
(**Studies on the fertility of artificial polyploid plants. V. Double pollination and competition in fertilization in respect of self-incompatible and cross-compatible pollen in *Brassica***).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1957 : No. 19 : 52–62.

Diploid and tetraploid self-incompatible turnip lines were pollinated with self pollen from 0 to 10 days before anthesis and with cross-compatible pollen from diploid or tetraploid *B. chinensis*, respectively, at anthesis. In the case of the diploid plants, self pollen effected 7·5% fertilization when applied 10 days before anthesis, 100% 5–6 days before anthesis and 0% at anthesis. In the case of the tetraploids, self pollen effected 10·6% fertilization 8 days before anthesis, a maximum value of 60·5%, 2–4 days before anthesis and 0%, 0–1 days before anthesis. (Cf. *PBA*, XXVI, Abst. 3872).

4543 Nieuwhof, M.
Vegetatieve instandhouding en vermeerdering bij koolgewassen. (**Vegetative maintenance and multiplication in *Brassica* crops**).
Zaadbelangen 1957 : **11** : 110–12.

A popular account is presented of methods of

vegetative multiplication of cabbage, Brussels sprouts and cauliflower and their use in breeding.

4544 Camargo, L. de S.
Novas linhagens de repôlho e couve-flor para o Estado de São Paulo. (**New lines of cabbage and cauliflower for the State of São Paulo**).
Bragantia 1956 : **15** : 315–28.

Of over seventy cabbage varieties studied at the Campinas station in Brazil the only ones that produced seed were two local varieties, Louco [Crazy] and Da Terra [Local]. A method of pollination is described which consists in using forceps made of wood or bamboo, each being used only once so that sterilization after use is not necessary. By a system of self pollination followed by sib crossing between the best plants of the best lines it has been possible to select lines of Louco giving almost 100% of commercial heads, practically free from internal buds, with an average weight of 1442 g. and an average seed yield of 22·2 g. when grown in summer.
A similar method of selection was employed with cauliflowers, which however suffered less yield depression after selfing. The variety Campinas produced in this way is described as having heads of uniform shape, 20 cm. in diameter, formed 125–135 days from sowing; only plants resistant to *Xanthomonas campestris* were selected. Lines maturing slightly earlier and somewhat later were also selected.
The varieties Early Benares and Early Patna matured in 80–100 days when sown in the hot season, the heads being 12 cm. in diameter. By selection a form with more uniform heads, 9–18 cm. in diameter, has been produced. Reference is made also to an excellent local variety, Teresópolis, which is somewhat later in maturity and heads after 150–170 days.

4545 Jensma, J. R.
Teelt en veredeling van bloemkool. (**Cultivation and breeding of cauliflower**).
Meded. Inst. Vered. TuinbGewass. 1957 : No. 96 : Pp. 61.

After an account of the effects of different cultivation methods upon the degree of buttoning (formation of plants with fewer and smaller leaves than normally and a smaller curd), seed growing and breeding methods used in the Netherlands are discussed. Seed could be produced rapidly from old transplants, which button readily, and it was found that unripe seed germinated normally and gave normal plants. Self pollination occurred at a rate of 67·8% and inbreeding over four generations caused no inbreeding depression. Degenerate stamens resulting in male sterility occurred in 0·05% of the plants and appeared to be determined by a single recessive gene *ms*. In view of the high correlation found between earliness and leaf number, especially in early lines, it is recommended that breeding for earliness be based on selection for low leaf number. Curd quality was found to be related to seed yield, plants poor in quality giving the highest yields. Poor quality appeared to be governed by recessive factors. For summer growing, the breeding objectives are lateness, which is correlated with resistance to buttoning, and resistance to riciness of the curd; the variety Lecerf is recommended as a source of lateness and Alpha as a source of quality. Methods of propagating selected material are described. For the production of autumn-grown crops, crossing of the good-quality variety Flora Blanca with frost-resistant strains of winter cauliflower from the island of Walcheren is suggested.

4546 Quak, F.
Bladvlekkenziekte bij spruitkool veroorzaakt door *Mycosphaerella brassicicola* (Fr.) Lindau. [**Ringspot disease in Brussels sprouts caused by *M. brassicicola* (Fr.) Lindau**].
Meded. Dir. Tuinb. 1957 : **20** : 317–20.

No resistant material was found among 40 varieties, but one line appeared to be less susceptible than the others.

4547 Hanaoka, T.
(**Studies on seed production of spinach. II. The effect of temperature treatment on the growth and flowering of spinach**).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 71 : 128–34. [Japanese].

Intervarietal differences in response to vernalization were less pronounced than in response to photoperiodic treatment (cf. Abst. 3518).

4548 Vilmorin, R. de & Bilquez, N.
Variations de la teneur en acide oxalique chez quelques variétés d'épinards. (**Variations in the oxalic-acid content of some spinach varieties**).
CR Acad. Agric. Fr. 1957 : **43** : 497–99.

Considerable intervarietal variation in the oxalate content of three French varieties was

detected. The variety Géant d'Hiver [Winter Giant] had the lowest content. Oxalate content is strongly correlated with total ash.

4549 Jones, H. A., McLean, D. M. & Perry, B. A.
Breeding hybrid spinach resistant to mosaic and downy mildew.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 304–08.

Diecious lines of the smooth-leaved Viroflay type, resistant to downy mildew (*Peronospora effusa*), have been combined with mosaic-resistant Virginia Savoy as pollen parent to produce many experimental hybrids, of which one, the topcross Early Hybrid 7, has been released for commercial production (cf. *PBA*, XXVI, Abst. 1854 and XXVII, Abst. 2357). The seed parent (99 x 95) of this hybrid is highly resistant to downy mildew but is not homozygous for this character. F_1 hybrids having ♀ parents homozygous for downy-mildew resistance and inbred ♂ parents of the savoy-type resistant to both this disease and mosaic are being developed. In producing seed of Early Hybrid 7, four rows of the seed parent are planted to one row of the pollen parent, the former being rogued for males as early as possible.

4550 Jones, H. A., Perry, B. A., McLean, D. M. & Leeper, P. W.
Dixie Market.
Sth. Seedsman 1957 : **20** : No. 6 : 17, 38.

Dixie Market is a savoy type of spinach highly resistant to blue mould and cucumber mosaic. Because of its fast growth the variety bolts readily and is recommended only for autumn and winter production in the southern USA. It was developed by back crossing an F_2 segregate of Virginia Savoy x a smooth-leaved blue-mould resistant selection of the Viroflay type to Virginia Savoy.

4551 Pearson, O. H.
The nature of the rogue in 456 lettuce.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 270–78.

Nonheading rogues in variety 456 (= Imperial 456, Cornell 456) are due to a single incompletely dominant gene, *K*, probably occurring at a locus characterized by a high degree of spontaneous mutability. *KK* plants have a semierect rosette habit. Although showing a definite tendency towards heading, *Kk* plants never produce firm heads. Both *KK* and *Kk* rogues are darker green than the normal *kk* type.

4552 Rappaport, L. & Wittwer, S. H.
Night temperature and photoperiod effects on flowering of leaf lettuce.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 279–82.

Bibb, Grand Rapids and Tendergreen, a variety developed from Bibb x Grand Rapids (cf. *PBA*, XXVI, Abst. 2894), showed marked differences in response to photoperiod and night temperature. They were respectively classified as late spring, summer and winter lettuces. Tendergreen resembled Bibb in that the induction of flowering was primarily dependent upon photoperiod.

4553 Huyskes, J. A. & Rodenburg, C. M.
International collaboration in the study of varieties of lettuce.
Euphytica, Wageningen 1957 : **6** : 94–95.

Collaboration between investigators in England, France, Germany and Holland has resulted in a classification of the world's lettuce varieties.

4554 van Hoof, H. A.
Verschil in reactie van wilde sla ten opzichte van besmetting met het slamozaiekvirus. (**Differences in reaction of wild lettuce with respect to infection with lettuce mosaic virus**).
Med. Proefsta. Groenteteelt volle Grond. 1957 : No. 8 : 285–90.

Several species of *Lactuca* tested for reaction to *Lactuca* virus 1 all proved susceptible. Details are given of the different symptoms developed after infection in samples of *L. virosa* and *L. serriola* from various districts in Europe.

4555 Lingle, J. C. & Carolus, R. L.
Mineral nutrition of celery varieties with special reference to sodium and boron.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 309–17.

Leaf analysis revealed significant varietal differences in response to B or Na.

4556 Yamaguchi, M. & Minges, P. A.
Brown checking of celery, a symptom of boron deficiency. I. Field observations, variety susceptibility, and chemical analyses.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 318–28.

Utah 10–B proved to be the variety most susceptible to brown checking while Summer Pascal and Utah 52–70 were the most resistant. Susceptibility to brown checking was associated with a low B content and high K/B ratio.

4557 Ricerche sulla cicoria di Treviso. **(Research on Treviso chicory).**
Agricoltura d. Venezie 1957 : **11** : 267–81.
Descriptions are included of the varieties Radicchio rosso di Treviso [Treviso Red chicory] and Variegato di Castelfranco [Castelfranco Variegated].

4558 Egorova, G. S.
(New varieties of cucurbits).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 4 : p. 33. [Russian].
Descriptions are given of the melon Limonnoželtaja [Lemon-yellow], selected from open pollinated Kolhoznica 749/753 at Krasnodar, and the water melon Bykovo 22 (Melitopolj 143 x Belosemjačko 187 [White-seeded 187]) bred at Bykovo. The new melon outyields its female parent and has larger fruit, shows resistance to drought and diseases and matures early and uniformly. The new water melon is early, productive and resistant to drought and scorching. The flavour, consistency, transportability and keeping properties of both are good.

4559 **Research work and workers.**
Seed World 1957 : **80** : No. 8 : 32–33.
Developed from a cross between Fairfax and Florida Giant at the Southeastern Vegetable Laboratory, Charleston, SC, USA, a new watermelon variety named Blackstone combines the disease resistance of Fairfax with the shape, colour, seed pattern and other morphological characteristics of Florida Giant.

4560 Hayase, H. & Ueda, T.
(Studies on *Cucurbita* crosses. IX. On hybrid vigour in *C. maxima* crosses).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 71 : 119–27. [Japanese].
Crosses involving six inbred lines were investigated. Reciprocal differences were not observed. Most of the F_1 hybrids displayed heterosis, in particular as regards fruit weight. The quality of the hybrid fruits was superior to and the hybrids were earlier than the parent inbreds. (Cf. Abst. 3526).

4561 Hayase, H.
(Studies on *Cucurbita* crosses. XI. Cytogenetical studies on interspecific hybrids of *C. maxima* x *C. pepo*).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1957 : No. 72 : 48–58. [Japanese].
Hybrids of the above species have been obtained by embryo culture. They are feeble and apparently self sterile. Fruits have been set by back crossing. Meiosis in the hybrids is irregular. The most frequent meiotic configurations were $0\text{–}1_{III} + 15\text{–}20_{II} + 4\text{–}10_{I}$; up to 3 quadrivalents were observed. Tapetal degeneration also occurred. (Cf. Abst. 935).

4562 Schagen, R.
Embryologische Untersuchungen am Feigenblattkürbis (*Cucurbita ficifolia* Bouché) nach Bestäubung mit Pollen des Gartenkürbis (*C. pepo* L.). **(Embryological studies on *C. ficifolia* Bouché after pollination with *C. pepo* L.).**
Forschung und Beratung 1956 : No. 5 : 163–65.
Crosses between the above two species, made with the aim of introducing the frost and disease resistance of the former into the latter, yielded 2% ripe fruits, most of which contained empty seeds. Embryological studies showed that pollen tube growth of *C. pepo* in *C. ficifolia* styles was retarded, resulting in only 24% fertilization, and that endosperm and embryo development were inhibited in fertilized ovules.

4563 Takashima, S.
(Studies on the differentiation of wild and cultivated species of *Cucurbita*. I.).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1956 : No. 8 : 38–43. [Japanese].
The taxonomy, history and evolution of *C. pepo*, *C. moschata* and *C. maxima* are discussed, with special reference to Japanese varieties.

4564 Agrawal, J. S., Khanna, A. N. & Singh, S. P.
Studies in floral biology and breeding of *Momordica charantia* Linn.
Indian J. Hort. 1957 : **14** : 42–46.
Crosses made between wild and cultivated plants of *M. charantia*, at the Government Agricultural College, Kanpur, gave F_1 fruits intermediate in size, shape and flavour between those of the parents.

4565 Wilson, J. D., John, C. A. & Wohler, H. W.
Ohio MR-200, a mosaic-tolerant, slicer-type cucumber.
Res. Circ. Ohio agric. Exp. Sta. 1957 : No. 41 : Pp. 11.
The above variety, released by the Ohio Agricultural Experiment Station, is characterized by

its tolerance of cucumber mosaic, enabling it to give better growth and higher yields than Marketer when mosaic is present. It matures a little earlier than Marketer and Burpee Hybrid and its fruits are shorter and greener than those of the latter variety but it is more susceptible to injury by fungicide sprays. Its origin is Niagara x Ohio Heinz 248 [([Chinese Long x White Spine Mosaic Resistant Line] x Ohio 31) x Straight 8].

4566 El-Din Fouad, M. K.
Studies on genetic and on chemically induced resistance of cucumber tissues to *Cladosporium cucumerinum* (Ell. & Arth.).
Meded. LandbHoogesch., Wageningen 1956 : **56** : No. 10 : 1–55; and Meded. Lab. Phytopath., Wageningen 1956 : No. 164.

No visible structural or chemical changes were observed in the cells or cell walls of the resistant variety Mabro (Highmoor x Lentse gele [Lent Yellow]) after inoculation with *C. cucumerinum* while in the second resistant variety examined, Proso (Highmoor x Spiers), resistance to invading hyphae was always accompanied by the formation of a yellow granular substance both within the cells and in the intercellular spaces. The genetically controlled resistance of both these varieties can be broken down by narcosis with ether or chloroform but no such effect was observed when resistance was chemically induced by means of a solution of G33.

4567 Kozlova, N. A., Taranova, E. A. & Kiece, V. T.
(Changes in dominance of parental characters concerning fruit structure depending on the age of hybrid tomato plants).
Latv. PSR Zināt. Akad. Vestis 1956 : No. 6 : 73–82. [Russian].

Experiments conducted at Kleisty, Latvia, with tomatoes suggest that (1) the ages of the parental plants affect the dominance of such characters as fruit shape and size and number of locules in the F_1 and (2) these dominance effects are not heritable. The F_1 of Borghese ♀ x Yellow Pierette ♂ from crosses in which the first, fourth and fifth inflorescences of the mother plant were pollinated mostly resembled the ♂ parent, while the F_1 from the second and third maternal inflorescences resembled the ♀ parent or was intermediate. The F_2 most nearly resembled the original male parent.

4568 Andeweg, J. M. & Ruyten, J. H.
Seven years experience with hybrid tomatoes.
Euphytica, Wageningen 1957 : **6** : 26–37.

During 1950–56, 196 F_1 hybrids were tested in unheated glasshouses at the Institute of Horticultural Plant Breeding, Wageningen. The following 11 hybrids were found to be commercially acceptable: Glorie x Renova; Ailsa Craig x Glorie; Moneymaker x Kampioen; Renova x Tuckqueen; Ailsa Craig x Renova; Ailsa Craig x Tuckqueen; Glorie x Moneymaker; Glorie x Tuckqueen; Vagabond (leaf-mould resistant variety from Canada) x Ailsa Craig; Glorie x HES4245 (nematode-resistant introduction from Hawaii); and Ailsa Craig x HES4245. These hybrids were superior to standard varieties in vegetative vigour and total and early yields. Use of F_1 hybrids in unheated glasshouses in the Netherlands offers little financial advantage. Their cultivation in heated glasshouses may however be expected to result in much greater gain because of the higher early yields produced before July while prices are high. Under unfavourable weather conditions, crosses of Dutch commercial varieties with introductions from countries with a warmer climate gave disappointing results.

4569 **Growers' pride.**
Bruinsma Bull. 1957 : No. 2 : unpaginated.

An account is given of three new F_1 hybrids of tomato developed by the Bruinsma Hybrid Seed Company, Naalwijk, Netherlands. Growers' Pride is said to be an improvement over Potentate in vigour and fruit quality; it ripens at the same time as this variety. Unlike the older variety Single Cross for glasshouse cultivation, PX–10 is resistant to the new races of *Cladosporium* leaf mould. It produces fruit with high quality until late in the year. The very early hybrid Star PX–12 has given good results in both glasshouse and outdoor cultivation and is highly resistant to late blight.

4570 Šišković, M.
Hibridacija crvenog patlidžana. **(Hybridization of the tomato).**
Arh. poljopr. Nauk. 1956 : **9** : No. 25 : 65–78.

This report on tomato breeding in Serbia mentions hybrids of San Marzano and other cultivated varieties with *Lycopersicon racemigerum*; they are early, vigorous, productive, resistant to diseases and have a high dry-matter content. Material with similar characteristics

results from the crosses of the cultivated varieties with *L. esculentum* ssp. *microcarpa* vars. *cerasiforme* and *pruniforme*. Some heterotic intervarietal hybrids of the cultivated tomato were obtained, notably from crosses involving San Marzano, Nunhems and Marglobe.

4571 Samsonova, I. A.
(Utilizing the method of labelled atoms for the study of vegetative rapprochement).
Agrobiologija (Agrobiology) 1956 : No. 6 : 55–58. [Russian].

Incompatibility between the tomato and *Solanum nigrum* was overcome by vegetative-rapprochement experiments at Moscow. By using pollen labelled with P^{32} in direct and reciprocal crosses, it was shown that improved crossability was caused by a greater number of pollen tubes reaching the ovary. Crossability was further improved by applying rapprochement to the later generations.

4572 Solovjeva, N. A.
(Distant hybridization within the family Solanaceae).
Agrobiologija (Agrobiology) 1956 : No. 6 : 91–96. [Russian].

This report on vegetative-sexual hybridization at Gribovo describes early-ripening, productive forms of tomato with larger fruits and a higher dry-matter content than 01180 Gruntovoĭ Gribovskiĭ [01180 Outdoor Gribovo]. The following are among the hybrids of economic value: (1) F_2 Bison/*Cyphomandra* x [F_1 Bison/*Cyphomandra* x (F_1 Gruntovoĭ Gribovskiĭ x *Lycopersicon hirsutum*)]; (2) F_1 [F_1 Bison/*Solanum muricatum* x (F_1 Gruntovoĭ Gribovskiĭ x *L. hirsutum*)] x Luchshiĭ iz Vseh [Best of All]; and (3) F_1 Bison x ([F_1 Bison x (F_1 Gruntovoĭ Gribovskiĭ x *L. hirsutum*)] x Bison).

4573 Thomason, I. J. & Smith, P. G.
Resistance in tomato to *Meloidogyne javanica* and *M. incognita acrita*.
Plant Dis. Reptr. 1957 : **41** : 180–81.

A tomato line from Hawaii, HES 4857, derived from *Lycopersicon esculentum* x *L. peruvianum* was found in California to be highly resistant to *Meloidogyne incognita* var. *acrita* and data obtained from back crosses to known susceptible lines indicate that resistance is determined by a single dominant gene. An F_3 line, 54N6, from a back cross of HES4857 to a commercial tomato variety, was found to possess resistance to *M. incognita* var. *acrita* and *M. javanica* and it is thought that the same gene confers resistance to both species.

4574 Hafen, L. & Stevenson, E. C.
Natural cross pollination in tomato using several male-sterile mutants.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 433–36.

Under conditions of natural pollination in Indiana, the amount of seed produced by lines each carrying one of the genes ms_{19}, ms_{21}, ms_{22} and sl_2 for male sterility was low. As indicated by the recessive seedling marker character of green stems, 21–67% of the seed resulted from selfing.

4575 Sagromsky, H.
Zur Chlorophyllbildung einer Tomatenmutante. **(Chlorophyll formation in a tomato mutant).**
Ber. dtsch. bot. Ges. 1956 : **69** : No. 11 : p. 17.

In the mutant of the tomato Lucullus described, the leaves are variegated when the plants are grown under normal conditions but green when they are undernourished.

4576 Vanterpool, T. C.
A tomato plant with powder-puff type of inflorescences.
Plant Dis. Reptr. 1957 : **41** : 481–82.

A single plant of Sutton's Best of All was found at Saskatoon, Sask., bearing pale green aborted flower rudiments in place of normal flowers and fruit. Proliferation of the deformed trusses occurred. Normal scions on abnormal stocks produced normal flowers while the abnormal stocks did not revert to normal, indicating that the effect was the result of mutation.

4577 Mertens, T. R., Burdick, A. B. & Gomes, F. R.
Phenotypic stability in rate of maturation of heterozygotes for induced chlorophyll mutations in tomato.
Genetics 1956 : **41** : 791–803.

Seed from a doubled haploid of *Lycopersicon pimpinellifolium* was exposed to X rays or thermal neutrons. The recessive chlorophyll mutants, two of which were lethal and the third sublethal, were chosen as material for a comparison between heterozygous plants and their homozygous normal sibs with respect to earliness and green weight of the plants. Earliness was evaluated by number of days to (1) first flower on the first inflorescence, (2) first flower on the second inflorescence and (3) first ripe fruit.

Only in the case of one mutant, the thermal-neutron induced lethal 228C, were significant differences detected, the heterozygotes being later than the homozygotes by all three criteria of earliness. The variance for the three determinations of earliness was however smaller for the heterozygotes than the homozygotes. The greater phenotypic stability of the heterozygotes may be interpreted on the basis of the action of two linked mutations, one affecting chlorophyll production and the other earliness. It is further suggested that clusters of mutations may have been produced by radiation.

4578 Mertens, T. R. & Burdick, A. B.
On the X-ray production of "desirable" mutations in quantitative traits.
Amer. J. Bot. 1957 : **44** : 391–94.
Investigations referred to in Abst. 2387 are described more fully.

4579 Felföldy, L. J. M.
Tomato grafting experiments at Tihany.
Nature, Lond. 1957 : **179** : p. 1144.
The author agrees with Bateman's interpretation that some of the changes observed in the seed progeny of tomato grafts may be attributed to the chance hybrid origin of a scion but is unable to accept the further suggestion that the original material may have been polymorphic (cf. *PBA*, XXV, Abst. 3508).

4580 Dini, M.
Intorno allo studio di una tecnica per l'innesto del pomodoro a partire da oggetti rappresentati da semi germinanti. (**On a study of a technique for grafting tomatoes by the use of scions consisting of germinating seeds**).
Frutticoltura, Bologna 1956 : **18** : 281–84.
A brief account is given of experiments in the graft hybridization of tomatoes, carried out at the Agricultural Technical Institute at Florence. Reciprocal grafting was successfully carried out between Golden Queen and San Marzano by inserting germinating seeds in a longitudinal slit in the stem of an older plant.

4581 Lollini, M.
Varietà di pomodoro da tavola. (**Tomato varieties for table use**).
Sementi elette 1957 : **3** : No. 2 : 34–42.
Brief descriptions are given of 59 varieties, from eight countries, in the collection of the Plant Breeding Institute at Bologna and recommendations are made for their use in Italy.

4582 Dereškevičus, K.
(**Application of colchicine in tomato breeding**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1482–86. [Russian].
Growing points of seedlings of the tomato Fill-basket were immersed in 0·01–0·1% solutions of colchicine. One of the lines selected after treatment was distinguished by dwarf habit and a yield of 500–600 c. per ha. compared with 419 c. for the standard Lithuanian variety, which it exceeded by some 10 days in earliness and in disease resistance.
Line 15, a chimera with diploid and tetraploid ($2n = 48$) tissue, exceeded all other lines in yield. Two pure tetraploid lines were also obtained, one of which had larger fruits than the parental variety; both however were inferior in fertility and yield.

4583 Poole, C. F.
Improvement in tomato ascorbic acid content.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 443–51.
In investigations at the University of Hawaii, a line P_B with high ascorbic acid content and low fruit weight, from a cross between *Lycopersicon peruvianum* and Michigan State Forcing, was combined with HES2958, having low ascorbic acid content, fairly good fruit weight and resistance to *Stemphylium* leaf spot, spotted-wilt virus and *Fusarium* wilt. Cycles of convergent improvement were then carried out in an attempt to combine high ascorbic acid content with large fruits in disease-resistant material. After the third convergent crossing, lines resistant to three more diseases, bacterial wilt, tobacco mosaic virus and nematode, and possessing well-sized fruits but low ascorbic acid content, were incorporated in the programme. The data obtained suggested that (1) genes for high ascorbic acid content were largely dominant whereas those enhancing fruit size were predominantly recessive and (2) negative correlation between fruit size and ascorbic acid content arose through the coupling phase of linkage introduced with the original cross, individual combinations of high concentration of ascorbic acid and large fruits in segregating populations being attributable to crossing over to the repulsion phase. Of four advanced populations studied, one attained a high degree of homozygosity in the repulsion phase.

4584 Hafen, L. & Stevenson, E. C.
The relative combining abilities of normal versus male-sterile mutants of tomatoes.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 429–32.

The results from crosses of male-sterile Rutgers (ms_{21}), male-sterile strains of Garden State (ms_{19}, ms_{20}, ms_{22} or sl_2) and normal plants of these varieties with Pritchard and other tester varieties indicated that fertile and sterile strains of a single variety may show some differences in combining ability. The results also indicated that genes for early maturity and total yield may act independently. It is postulated that differences in yield between hybrids involving fertile and sterile parents may reflect general genetic differences and not necessarily be related to effects of the genes for sterility.

4585 Goodman, O.
Breeding tomatoes to resist blight.
Grower 1957 : **47** : 179, 181–83.

In tests of accessions for resistance to *Phytophthora infestans* at the Johnstown Castle Agricultural College, Wexford, Ireland, three lines of *Lycopersicon pimpinellifolium* and one of *L. esculentum* ssp. *cerasiforme* were the most resistant. Of the 43 commercial varieties tested, only Atom was highly resistant. Hybridization has been initiated to transfer resistance to commercial tomatoes. One of the two F_1 hybrids already obtained, Atom x Devon Surprise, has outyielded the latter parent.

4586 Tolba, M. K. & Salch, A. M.
Studies on the physiology of host-parasite relations. VI. Physiological analysis of the susceptibility of three tomato varieties growing in Egypt to attack by *Fusarium culmorum* and *Fusarium oxysporum*.
Bull. Inst. égypt. 1953–54 : **36** : 205–20.

Pritchards [*sic*] has shown greater susceptibility than North Dakota or IAB to both the above species of *Fusarium* at Cairo and it is suggested that there may be some connexion between susceptibility and the reducing sugar and amino-nitrogen content and pH of the fruits, since Pritchards was found to have a higher reducing sugar and amino-nitrogen content and a lower pH value than the other two varieties. The presence of a thermolabile inhibitory substance in IAB and North Dakota is indicated by the better growth of the fungi on autoclaved juice than on cold-sterilized juice from green fruits. No such substance appears to be present in the red fruits of these varieties nor in red or green fruits of Pritchards. (Cf. *PBA*, XXIV, Abst. 2548).

4587 **Report on the work of the West of Scotland Agricultural College for the year ended 30th September, 1956** :
Pp. 76.

High-yielding selections immune from *Cladosporium* leaf mould were again obtained from hybrids involving *Lycopersicon peruvianum* in their parentage (cf. *PBA*, XXVI, Abst. 3910).

4588 Day, P. R.
Mutation to virulence in *Cladosporium fulvum*.
Nature, Lond. 1957 : **179** : 1141–42.

The mutational step from race 0 to race 2 was induced by X irradiation of the young mycelium. Attention is drawn to the possibility that mutation to increased virulence on the tomato Vetomold as the result of unintentional irradiation of pathogens may be more than offset by improvements induced in the host.

4589 Ohova, E. P.
(Changes obtained in tomatoes as a result of vegetative hybridization).
Agrobiologija (Agrobiology) 1956 : No. 5 : 70–76. [Russian].

A description is given of the tomato vegetative hybrid, 77a, obtained at Tiraspolj, Moldavia, from the stock of Bolgarskiĭ 014 [Bulgarian 014] egg plant/Break o' Day tomato. It is vigorous, highly productive, tolerant of *Orobanche* and resistant to *Macrosporium* and other diseases. Some of the hybrid plants had branches terminating in a single flower instead of a cluster.

4590 Gilbert, J. C. & McGuire, D. C.
Inheritance of resistance to severe root knot from *Meloidogyne incognita* in commercial type tomatoes.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 437–42.

As indicated by investigations at the Hawaii Agricultural Experiment Station, resistance to *M. incognita* in derivatives of *Lycopersicon esculentum* x *L. peruvianum* depends upon a dominant gene, *Mi*, in linkage group IV. Selection for horticultural characters in the field has been strongly biased in favour of heterozygotes for root-knot resistance. Both late maturity and a high degree of susceptibility to concentric cracking of the fruit have tended to be associated with homozygous resistance to *M. incognita*. Recent combinations within the breeding material have given a much higher

proportion of selections both commercially acceptable and homozygous for resistance, probably as the result of successive breaking of undesirable linkages.

4591 Pichenot, M.
Essai de greffage interspécifique dans le genre *Solanum.* (**Interspecific grafting experiment in the genus *Solanum*).**
CR Acad. Sci., Paris 1957 : **244** : 2544–46.

S. sisymbrifolium grafted on *S. melongena* had larger and darker leaves, flowered and fruited later, produced more and bigger flowers, fruits and viable seeds, in spite of having a higher percentage of inviable seeds, than ungrafted plants of the same species; the modifications were retained in plants grown from seed from the grafted material. The changes induced by grafting on *S. melongena* were less marked than those obtained when *Datura stramonium* was used as stock.

4592 Ockey, C. H.
An interchange heterozygote in *Vicia faba.*
Nature, Lond. 1957 : **179** : 740–41.

The points of the interchange found in a single seedling were probably immediately proximal to the nucleolar-organizer constriction of one homologue of chromosome 1 and at the distal end of the long arm of one homologue of chromosome 3.

4593 Rowlands, D. G.
The problem of yield in field beans.
Agric. Progr. 1955 : **30** : 137–47.

A detailed analysis has been carried out at the Welsh Plant Breeding Station of the primary yield components in ten spring and six winter strains of field broad beans. Significant differences were found between varieties in respect of fertility, grain yield, flowering date, number of tillers, height, first flowering node and first pod-bearing node but not in respect of pod number. The results obtained from crosses between dissimilar and similar varieties indicated that the parental varieties were more efficient under conditions of high soil fertility than the F_1 hybrids in pot experiments.

4594 Mariën, A.
Struikprinsessenproef in Benelux-verband. (**Dwarf bean trial in the Benelux Union).**
Tuinbouwber., Groningen 1957 : **21** : 46–49, 65–68.

Data are given on the earliness, productivity, quality and resistance to diseases and wind damage of eight Belgian, Netherlands and other varieties tested at the eight Belgian stations participating in joint trials held in 1956 in the Benelux countries.

4595 Ančev, T.
(**A contribution to the study of the qualitative characteristics of the bean (*Phaseolus vulgaris* Savi) from the environs of Tetovo).**
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje)/Ann. Fac. Agric. Sylvicult. Univ. Skopje : Zemjod. : 1954/55 and 1955/56 (1956) : No. 8–9 : 167–79. [Macedonian].

Data on 100-seed weight, size of bean, skin percentage, thickness of the skin and cookability of the high-quality land varieties Pločka and Tetovo are presented.

4596 Spasojević, V.
[**Induction of autotetraploidy in the bean (*Phaseolus vulgaris* L.)].**
Zborn. Rad. Inst. Fiziol. Razvić. Genet. Selekc. (Rev. Wk. Inst. Physiol. Develop. Genet. Select.)/Rec. Trav. Inst. Physiol. Dévelopg. Génét. Sélect., Beograd 1956 : No. 4 : 117–34. [Serbian].

A tetraploid, obtained by colchicine treatment of a white-seeded variety, is described. It is late in flowering and ripening and has large seed.

4597 Firbas, H.
Beitrag zum Thema "Selbstbefruchtung". (**Notes on the theme "self fertilization").**
Gartenbauwiss. 1956 : **3** : 306–07.

Cross fertilization to an extent varying from 1 to 5% has been observed in bean varieties growing in Argentina, the agent being thought to be *Acanthoscelides obtectus.* In tomatoes cross pollination of 1·6–5·4% is reported.

4598 Bańkowska, H.
Badania nad niestałymi cechami u *Phaseolus vulgaris* L. (**Studies of labile characters in *Ph. vulgaris* L.).**
Acta agrobot., Warszawa 1956 : **5** : 71–137.

A full account is given of work referred to in Abst. 3572.

4599 Walter, J. M. & Lorz, A. P.
Florigreen. A disease-resistant pole bean.
Circ. Fla. agric. Exp. Sta. 1956 : No. S–92 : Pp. 8.

Resistant to *Uromyces phaseoli* var. *typica* and to common and southern bean mosaics, Florigreen (F–M191 x Pinto 5) is considered to be

suitable as a substitute for the susceptible variety F–M191. It also has the advantage of being ready for harvesting 3–5 days earlier.

4600 v. d. Giessen, A. C. & v. Steenbergen, A.
A new method of testing beans for anthracnose.
Euphytica, Wageningen 1957 : **6** : 90–93.
The following method for testing large numbers of seedlings in breeding for resistance to *Colletotrichum lindemuthianum* has been devised at the Institute of Horticultural Plant Breeding, Wageningen. Seedlings from which the seed-coat has been removed are placed on frames inserted in zinc or wooden containers. After a further two days' development, the seedlings are inoculated. The temperature is kept at 15–22° C. and high humidity of the air is obtained by covering the containers with plastic.

4601 Bocanegra Salazar, S.
Variedad mejorada de frijol Canario para la Costa Central del Perú. (**An improved variety of the Canario bean for the central coastal area of Peru**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 338 : 14–16. (Mimeographed).
Selection La Molina 1 from the variety Canario [Canary] of *Phaseolus vulgaris* is described. It excels the original Canario by 16–25% in yield, having produced up to 1200 kg. of seed per ha., and is resistant to anthracnose (*Colletotrichum lindemuthianum*).

4602 Cetas, R. C. & Wester, R. E.
Natural crossing in lima beans on Long Island, New York, in 1955.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 392–93.
Every third row was planted with Fordhook 242 which has white cotyledons; the other rows consisted of Fordhook families with green cotyledons. Using white cotyledons as the marker character, natural crossing was found to range from 4 to 48%, with an average of 32%.

4603 Allard, R. W.
Genes modifying the Cc and Rr loci in lima beans.
Proc. Amer. Soc. hort. Sci. 1956 : **68** : 386–91.
The difference between L2 and Green-seeded Henderson in seed-coat colour depends upon four loci, *C*, *R*, *Cm* and *Rb*. The effects of genes at *C* and *R* upon colour of the seed coat and hypocotyl have already been described (cf. *PBA*, XXIII, Abst. 3106). The gene *Cm* changes the maroon seed-coat resulting from the combination of *C* and *rr* to scarlet, while *Rb* inhibits the production of red pigment in the hypocotyl by *R* and changes the dark-red seed coat associated with *R* to lavender buff.

4604 Šimanskiĭ, N. K.
(**Breeding the soya bean**).
Dopov. Akad. Nauk Ukraïn. RSR (Proc. Ukrain. Acad. Sci.) 1956 : No. 3 : 303–05. [Ukrainian].
Unemasculated plants of such varieties as Staroukrainskaja (Old Ukrainian) were pollinated with pollen mixtures of 2–3 other varieties at the USSR Institute of Breeding and Genetics (VSGI). The resulting hybrids gave, with one exception, uniform progenies of the maternal type. The exception was a hybrid of Staroukrainskaja x Harbin 111 + 42 + VSGI44, which resembled the last mentioned pollen parent. This had been previously selected at the institute and is early and productive and has large seeds. Mention is made of another hybrid, obtained by pollination of emasculated flowers of Harbin 111 by mixed pollen of three other varieties. The hybrid is earlier than the maternal parent and outyields all the pollen parents.

4605 Caviness, C. E. & Smith, P. E.
Arkansas soybean variety trials 1951 to 1956.
Rep. Ser. Arkans. agric. Exp. Sta. 1957 : No. 65 : Pp. 11.
The results of tests carried out on varieties at several centres in Arkansas are summarized.

4606 Zacharias, M.
Mutationsversuche an der Sojabohne (*Glycine soja* [L.] Sieb. et Suce.). [**Mutation experiments with soya bean (G. soja [L.] Sieb. et Zucc.)**].
Kühn-Archiv 1956 : **70** : 553–54.
The results reported in this dissertation have been referred to in Abst. 3582.

4607 Clark, F. E.
Nodulation responses of two near isogenic lines of the soybean.
Canad. J. Microbiol. 1957 : **3** : 113–23.
A single-gene mutant highly recalcitrant to nodulation (cf. *PBA*, XXIV, Abst. 2568) and a nodulating sister line showed no differences in number of rhizobia in the roots, ascorbic-acid content in the roots and tops, and kind and quantity of aminoacids in the seeds and seedlings.

4608 BLANCHARD, M.
Recherches sur la biologie et la culture du soja en Algérie. (**Researches on the biology and culture of the soya bean in Algeria**).
Ann. Inst. agric. Algér. 1956 : **9** : No. 7 : Pp. 115.

Varieties introduced into Algeria are classified and data are provided on the results of recent variety trials.

4609 ERDMAN, L. W., JOHNSON, H. W. & CLARK, F.
Varietal responses of soybeans to a bacterial-induced chlorosis.
Agron. J. 1957 : **49** : 267–71.

The reactions of 40 varieties to strains of *Rhizobium japonicum* known to cause chlorosis in Lee ranged from complete resistance to a high degree of susceptibility, ten varieties remaining free from chlorosis.

4610 NITTA, K.
(**A rapid method for determining the oil content of soya-bean seeds**).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 71 : 109–13. [Japanese].

A rapid technique suitable for breeders is described. Crushed seeds are saponified in the presence of KOH and ethanol; the fatty acids are extracted with petroleum ether and then titrated against NaOH.

4611 ICHINOHE, M. & ASAI, K.
(**Studies on the resistance of soya beans to *Heterodera glycines*. I. The resistance of Hienuki 1 and Nanguntakedate**).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 71 : 67–79. [Japanese].

The comparative behaviour of the above two resistant varieties and of two susceptible varieties after artificial infection by nematodes was investigated. Resistance was associated with larval death after invasion, large number of bacterial root nodules and vigorous root system.

4612 PHILIPP, F.
Ergebnisse der Gemüsesortenversuche 1956, II. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of vegetable variety tests 1956, II. (In connexion with the Commission for the Austrian Book of Cultivated Varieties**)].
Mitt. Klosterneuburg : Ser. B. : 1957 : **7** : 125–39.

The results of trials of peas are reported.

4613 LAMPRECHT, H.
Die Lage der Gene *Ve* und *Vim* in den Chromosomen II bzw. IV von *Pisum*. (**The position of the genes *Ve* and *Vim* in chromosomes II and IV respectively of *Pisum***).
Agri hort. genet., Landskrona 1957 : **15** : 1–11.

The results of crossing-over studies have confirmed that the recessive *ve* lies on chromosome II (cf. *PBA*, XXIV, Abst. 3493) in the position *Oh–Ve–S–Wb–K*. The gene *Vim* (cf. *PBA*, XXVI, Abst. 2953), which appears to be almost identical in its effects with *Pa*, is linked with *Le* on chromosome IV. The gene sequences *M–St–B* on chromosome III and *R–Tl–Bt* on chromosome VII have also been established.

4614 LAMPRECHT, H.
Zur Genenkarte von Chromosom II von *Pisum*. (**On the gene map of chromosome II of *Pisum***).
Agri hort. genet., Landskrona 1957 : **15** : 12–47.

A survey of previous linkage studies of chromosome II is presented together with the results of 29 recent crosses. From the combined results a gene map with the loci lying in the order *La–Wa–Oh–Ar–Ve–*[Cht_2]*–S–Wb–K–Fn* is constructed. The position of Cht_2, designated cl_3 by Wells (cf. *PBA*, XXI, Abst. 2268), is regarded as uncertain.

4615 LAMPRECHT, H.
Studien zur Genenkarte von Chromosom V von *Pisum*. (**Studies for the gene map of chromosome V of *Pisum***).
Agri hort. genet., Landskrona 1957 : **15** : 58–89.

The crossing-over values obtained from previous studies and recent crosses involving the genes *Cp*, *Gp*, *Cr*, *Cri*, *Te*, *Cal*, *Fs*, *Ce* and *U* are used as a basis for a gene map, the loci lying in the above order. The crossing-over values suggest that the genes *Cp* and *U* lie at some distance from the extreme ends of the chromosome.

4616 FRIES, N.
Some experiments aiming at an isolation of biochemical mutations in *Pisum sativum* L.
J. Madras Univ. 1957 : **27** : 9–16.

In investigations at the Institute of Physiological Botany, University of Uppsala, Sweden, three root cultures derived from X_2 seedlings at first showed biochemical deficiencies, possibly as the result of mutation. The cultures later reverted to the ability to grow on a mineral medium. In view of the well-known variability

of root cultures in the course of time, caution is required in interpreting this reversion as back mutation.

4617 Mateo Box, J. M.
Guisantes: variedades y cultivo. (**Peas: varieties and culture**).
Manuales tec., Minist. Agric., Madrid : Ser. A19 : 1955 : Pp. 187.

The information presented in this booklet includes: a description of morphological characters; a discussion of variation in earliness and resistance to diseases and low temperatures; a brief account of the qualities required for canning or freezing; descriptions of 50 varieties grown in Spain; and details of cultivation.

4618 Scheibe, A.
Über gengesteuerte Formbildungsprozesse beim Sprossaufbau der Erbse. (**On gene-controlled morphogenetic processes in the shoot development of the pea**).
Angew. Bot. 1956 : **30** : 129–34.

Studies of fasciated (*fafa*) and normal (*FaFa*) plants, showed that the characteristic broadening of the stem in *fafa* plants was first visible in the 12–14th internodes. In reciprocal grafts of the two types, the scion determined the form of the mature plant. Appropriate concentrations of β-indolylacetic acid or α-naphthylacetic acid were able to induce fasciation in normal stems and it was demonstrated that fasciated plants had a higher concentration of four growth substances (β-indolylacetic acid, β-indolacetonitrile, β-indolaldehyde and an unidentified substance) than normal individuals, the highest concentrations being found between the 7th and 13th nodes. Since these growth hormones appear to be tryptophane derivatives, it is suggested that the gene *fa* determines an increase in tryptophane production.

4619 Lamprecht, H.
Die Koppelung der Teilfarbigkeitsgene *Dem* und *Lob* von *Pisum*. (**The linkage of the genes *Dem* and *Lob* for partial coloration in *Pisum***).
Agri hort. genet., Landskrona 1957 : **15** : 48–57.

The mode of action of the genes *A*, *Z*, *Mp*, *Dem*, *Cal*, *Lob*, *Ve* and *Pal*, responsible for partial coloration of the testa (cf. *PBA*, XVIII, Abst. 2572 and XXVI, Abst. 3940), is described. On the basis of crossing-over data, the following positions are given for *Dem* and *Lob*: chromosome III, *Uni–M–Rf–Mp–Lob–F–Pu–Cry–St–B–Gl*; chromosome IV, *N–Z–Dem–Fo–Fa–Tra–Td–Con–Br–Vim–Le–V*.

4620 Lamprecht, H.
Die Koppelung des Gens *Gri* von *Pisum*. (**The linkage of the gene *Gri* of *Pisum***).
Agri hort. genet., Landskrona 1957 : **15** : 90–97.

From the results of seven crosses it is shown that the gene *Gri*, which in the recessive condition determines the development of a grey band of colour round the seed (cf. *PBA*, XVII, Abst. 2572), lies on chromosome I in the position *A–Vi*$_1$*–Au–Lf–D–Pur–Lac–Cor–Am–O–Sp–Red–I–Gri*.

4621 Laumont, P. & Chevassus, A.
Note sur l'amélioration du pois chiche en Algérie. (**Note on the improvement of the chickpea in Algeria**).
Ann. Inst. agric. Algér. 1956 : **10** : No. 2 : Pp. 24.

The economic characteristics of the chickpea varietal collection at the Maison-Carrée research station are described. At present, breeding is confined to mass and genealogical selection of this material.

4622 Hájek, D.
Znáte naše odrůdy povolených čoček? (**Do you know our approved varieties of lentils?**)
Za vysokou úrodu 1957 : **5** : 255–57.

The list of Czechoslovak approved varieties includes two large-grained varieties, Pisárky and Hrotovice lentils, two Slovak medium-grained varieties and a small-grained variety from Moravia. The results of varietal trials in the years 1952–6 are given. Varietal characteristics and the suitability of the varieties for special uses are summarized.

4623 Vjazov, A. A.
(**New forms of basil for the conserving industry**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1956 : No. 26 : 28–37. [Russian].

A set of some 10% is obtained from *Ocimum basilicum* on selfing. A large collection of forms of varied provenance was examined and two lines with an aroma resembling that of black pepper have been selected. The essential oil of one of them contains 74·8% of terpenes.

4624 Nevstrueva, R. I.
(**Questions on the biology of *Salvia sclarea***).
Agrobiologija (Agrobiology) 1956 : No. 6 : 128–30. [Russian].

A productive long-lived variety, 10, was selected from forms with a long vernalization period occurring among a population at the Nikita Botanical Garden.

FISHER, R. A. & YATES, F.
Statistical tables for biological, agricultural and medical research.
Oliver & Boyd, Edinburgh & London 1957 : 5th Ed. : 24s. : Pp. x + 138 : tables.

The fourth edition of this standard work was reviewed in *PBA*, XXIII, p. 479. The present edition has a number of important new features. The problem of testing the significance of the difference between means has been the matter of some controversy; a new table, VI 1, is given here for values of d for small odd integral values of n_1 and n_2. Geneticists will welcome the addition of table XIII 1 which gives product ratios for the coupling and repulsion phases for different recombination fractions. Other modifications include the following: tables XI, XI 1, XII and XII 1, dealing with the logit and complementary loglog transformations; X2, an enlarged table for final adjustments in the angular transformation; XIV, an amplified table of segmental functions; χ^2 values for $n =$ 30–70 have been added in table IV; and natural logarithms are given for the range ·0100 to ·1000 in table XXVI.

HEBERER, G.
Die Evolution der Organismen. (**The evolution of organisms**).
Gustav Fischer Verlag, Stuttgart 1957 : 2nd Ed. : Lieferung 5, DM 18.50 : Pp. iv + 857–1109 : figs. : 11 tables.

The first four Lieferungen of the second edition of this comprehensive survey of current evolutionary theory were reviewed in *PBA*, XXV, p. 262. The present Lieferung contains three contributions, the first of which, an article by the editor on the theory of additive typogenesis, completes the survey of the causes of evolution begun in Lieferung IV. The subject discussed here is the problem of the origin of the higher systematic units and the significance of the infrequency of intermediate forms. The account is based to a considerable extent on the work of Schindewolf and Simpson with the latter of whom the author is in general agreement. However, views of dissentients, such as Dewar and Heribert Nilsson, are according somewhat fairer treatment than is customary. The author concludes that Schindewolf's conception of the evolution of a higher group proceeding via an explosive phase (typogenesis), a more stable phase (typostasis) and a degenerative phase (typolysis) is only one of many evolutionary patterns and no special mechanism is thought to be necessary to account for the origin of the higher groups. The absence of intermediate forms is explained along the usual statistical lines. Only a brief and rather unsatisfactory consideration is given to degenerative evolution, and the reader is referred to the writings of Simpson and Remane.

The remaining two papers deal with human evolution, Dr. C. v. Krogh discussing the place of man among the primates and Prof. W. Gieseler dealing at length with the fossil record of man and his putative ancestors.

The biological action of growth substances. Eleventh Symposia of the Society for Experimental Biology.
Cambridge University Press 1957 : 55s. : Pp. vii + 344 : figs. : tables : plates.

The eleventh symposium of the Society for Experimental Biology was held at Aberystwyth, Wales, in September 1956 and the proceedings, embodied in this volume, contain a number of items of direct or indirect interest to plant geneticists. J. R. Raper spoke on Hormones and sexuality in lower plants, and from his review we learn that the regulation of the sexual processes in the aquatic phycomycete *Achlya* involves at least seven distinct diffusible agents, each stage being initiated and quantitatively regulated by the secretions of the last preceding phase. The gamones which control copulation in *Chlamydomonas* are now known to be glycoproteids; the elaborate *cis-trans*-crocetin-dimethylester system proposed by Moewus has not been substantiated by other investigators. Much less still is known about the intracellular control of the sexual process but the regular behaviour observed by the author in *Schizophyllum commune*, which is described, clearly indicates the functioning of some complex coordinating mechanism, possibly involving specific proteins.

In A physiological study on the nature of autonomous growth in neoplastic plant cells, A. C. Braun discusses the factors concerned in converting cells from the normal state to a state of uncontrolled proliferation. The studies with crown gall reported show that in addition to the two growth factors already known to be concerned, one an auxin that stimulates cell enlargement and the other stimulating cell division, several other systems capable of synthesizing growth substances are also involved in the transformation.

Other contributions include The physiological action and biological importance of germination

inhibitors, by M. Evenari, Hormonal aspects of fruit development in higher plants, by L. C. Luckwell, and Bioelectrical implications in plant tropisms, by A. R. Schrank.

ROBBINS, W. W., WEIER, T. E. & STOCKING, C. R.
Botany. An introduction to plant science.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1957 : 2nd Ed. : 56s. : Pp. ix + 578 : figs. : tables : plates.

The second edition of this attractively produced book is distinguished from its predecessor (cf. *PBA*, XXI, p. 225) not only by a number of new illustrations, many of them, notably some of the photomicrographs, being marked improvements over the old, but also by the revision of individual chapters and by the removal of the physiological sections from their position as appendages to the morphological descriptions of stem, leaf and root and their expansion into complete chapters on soil and mineral nutrition, water relations and photosynthesis and respiration; in addition, the angiosperms now receive a chapter to themselves and a glossary of botanical terms and their derivations has been appended. These modifications apart, the book remains essentially the same in scope and presentation. Simply written, with careful explanations, numerous summaries and frequent references to practical applications, it is, as the blurb puts it, "student-geared in approach". As before, however, the student's need for consulting relevant literature is not catered for: there is still a regrettable absence of bibliographical references.

CRAFTS, A. S., MACHLIS, L. & TORREY, J. G. (Editors)
Annual review of plant physiology. Vol. 8.
Annual Reviews, Inc. Palo Alto, California 1957 : $7.50 : Pp. 477 : figs. : tables.

Like its predecessors, this volume contains much which has direct or indirect bearing upon plant breeding, genetics and cytology (cf. *PBA*, XXVI, p. 669). H. Teas contributes a paper on Physiological genetics, in which he surveys a wide range of examples of physiological and chemical characteristics reported to be under genetic control in the higher plants. W. D. Billings discusses some aspects of Physiological ecology. In The Sugarcane plant, G. O. Burr and seven coauthors review investigations on growth habit, composition, mineral nutrition, carbohydrate metabolism, flowering and the effects of climatic factors upon growth and juice quality. In Drought resistance in plants and physiological processes, W. S. Iljin considers the influence of drought upon the functioning of the stomata, carbohydrate metabolism in green tissues, photosynthesis, respiration, osmotic pressure and desiccation. W. S. Rogers and A. B. Beakbane discuss Stock and scion relations under the main headings of the relative importance of root and stem, rootstock and interstock effects on fruiting, stock/scion incompatibility, other features [such as resistance to pests, diseases and frost] and hypothetical mechanisms of stock/scion interaction. Considerable attention has recently been given to the economic possibility of large-scale mass culture of algae for various purposes. In Mass culture of algae, H. Tamiya reviews the experimental progress achieved, on the basis of which the forecast that the time of the industralization of such culture is not far off seems justified. The remainder of the nineteen contributions comprise: Prefatory chapter by W. J. V. Osterhout, who summarizes experiments in which he has made use of aquatic plants in the study of some fundamental problems; Apparent free space, G. E. Briggs and R. N. Robertson; Mineral nutrition of plants, H. G. Gauch; Nitrogen metabolism in plants: ten years in retrospect, F. C. Steward and J. K. Pollard; Photochemistry of chlorophyll, J. L. Rosenberg; Biochemistry of chloroplasts in relation to the Hill reaction, K. A. Clendenning; Auxin relations in roots, B. Åberg; The history and physiological action of the gibberellins, B. B. Stowe and T. Yamaki; Ascent of sap, K. N. H. Greenidge; Permeability of plant cells, R. Collander; Physiology of phloem, K. Esau *et al.*; Effects of antibiotics on plants, P. W. Brian; and Soluble oxidases and their functions, W. D. Bonner (Jun.).

BLOCH, K.
Zur Theorie der naturwissenschaftlichen Systematik unter besonderer Berücksichtigung der Biologie. (**The theory of scientific systematics with special reference to biology**).
E. J. Brill, Leiden 1956 : f. 16 : Pp. 138.

The renaissance of taxonomy in recent years has been characterized by philosophic adventures by taxonomists and flirtations with taxonomy by philosophers. In a recent book, Gregg has discussed some of the logical problems posed by taxonomy (cf. *PBA*, XXVI, p. 125); the present treatise examines the more strictly

philosophical implications of taxonomic theory and of the disputes that divide taxonomists as to the "reality" of taxa.

Just as many contemporary logical developments were born in the later Middle Ages, only to be thrust into the background by the obscurantism so frequent among classical humanists, so also were the present discussions on the nature of taxonomic categories anticipated by the medieval controversies as to the nature of universals, which, again, the humanists and their successors, the historians of science, have begged us to despise. Dr. Bloch has presented the present problem in its correct historical setting and shown how it is only one facet of the problem of the nature of universals which was initiated in the writings of Plato and Aristotle, advanced considerably in the realist-nominalist controversies of the medieval scholastics, and further elucidated by later philosophers, notably Kant, Hegel and the Hartmanns.

The present work is a detailed discussion, at a consistently remote level of abstraction, of the distinctions between real and abstract and between individual and universal, and of the relevance of these notions to the hierarchical ordering of taxa of the systematist. It is shown that far too much philosophic naivety has attended taxonomic discussion as to the reality of taxa. For instance, it is commonly asserted that individuals or species are more "real" than, for instance, genera. The author shows that judgements that an individual pertains to a given species or that a system of organic structures constitute an individual depend on abstraction just as in the statement that a given group of species pertain to a given genus. Another useful point is made that phylogenetic studies cannot resolve problems of the sort mentioned; no amount of information on the origin of taxa is adequate for deciding on the nature of their contemporary differentiation.

The direction of resolution of taxonomic problems proposed by the author lies between the extreme realism of Plato and the idealist morphologists, on the one hand, and the nominalism of Ockham and his followers and the logical positivists today, on the other. The question as to what taxa are real and which not is shown to be spurious; the problem can only be properly formulated by considering in what sense or mode reality can be predicated of the gamut of taxa from individual to kingdom and of the morphological categories used in establishing taxonomic groups. When reexpressed in this way, the philosophic issue becomes simpler though the precise way in which any particular taxon can be regarded as real i likely to be highly complex.

GAMS, H.
Kleine Kryptogamenflora. Band IV Die Moos- und Farnpflanzen. (**Pocke cryptogram flora. IV. Bryophyte and pteridophytes**).
Gustav Fischer Verlag, Stuttgart 1957 DM16 : Pp. viii + 240 : 116 figs.

The volume of this series dealing with th Agaricales and Gastromycetales was reviewe in *PBA*, XXV, p. 634. The present volume which represents the fourth edition of a original bryophyte and pteridophyte flora com piled by the author, has been expanded t cover the whole of Europe and has been revise to take into account the numerous taxonomi and nomenclatural changes necessitated b recent bryological monographic studies. Th layout of the present volume is similar to tha of the volume already noticed. The liverwort are treated in pp. 25–74, the mosses in pp. 74 211 and the pteridophytes in the remainin twenty or so pages. Most of the volume i taken up by keys to the species; the fina entries for each species, however, include som very brief additional diagnostic notes an indications of habitat and geographical distri bution within Europe. There are numerou line drawings but the small size of these reduce their usefulness. Considered as a book for fiel studies, this volume should prove most valuabl to botanists studying the European bryophyta

SMITH, K. M. & LAUFFER, M. A (Editors)
Advances in virus research. Volum IV.
Academic Press Inc., New York 1957 $8.00 : Pp. ix + 340 : figs. : tables.

This year's volume (cf. p. 596 above) contains number of contributions of interest to geneti cists. The first is Factors in virus evolutio by C. H. Andrewes, who treats some of th aspects from what many geneticists may find t be a rather teleological viewpoint. In any cas however, the main fact that emerges is tha viruses are so relatively unstable that evolutio and change are going on all the time; hence i is admitted that it may be impossible even t guess at the shape of virus evolution in th past and no attempt is being made at presen to give them a comprehensive classification.

In Bacteriophages as genetic and biochemica systems, A. D. Hershey gives a review of curren trends in research on bacteriophages, for th benefit not only of virologists but of geneticist

and biologists in general. We are given a useful recapitulation of the main facts of bacteriophage reproduction; phage structure is now envisaged as follows. The particle contains its proper germinal substance, that is, a large obligatory piece of genetic material that infects bacteria with high probability and forms the material basis of the host-independent germ line of the virus. In addition the phage particle contains small pieces of accessory material that play only nonspecific roles in viral perpetuation, but occasionally function specifically in infective heredity of bacteria. Some of this material may be common to phage and bacterium and be the instrument of transduction. Present evidence indicates that phages may contain a single linkage structure: this is found to be the only well-established analogy between the genetic systems of phages and higher organisms; evidence is presented in favour of the biparental production of a single strand during replication, without loss of integrity of parental strands, so that recombinants would be produced one at a time by separate acts. Radiation experiments have shown that radiation can kill phage particles by producing local lesions in genetic material, and that undamaged parts can be rescued away from distant lesions by genetic recombination with live phage. Tracer analysis suggests that genetic specificity resides in protein-free DNA; but evidence suggesting the need for caution in using the Watson-Crick or other too simplified models of DNA synthesis is summarized.

N. W. Pirie examines The anatomy of tobacco mosaic virus and sounds a note of warning about some of the assumptions that are commonly made by investigators; though the virus does, it seems, consist largely of a stable complex of protein and RNA, most preparations contain other components too and it is suggested that more study should be devoted to these before final conclusions can be made about the nature of the virus itself. It is pointed out that there may well be strains of virus, with different biological properties, having identical compositions though different configurations, and these are impossible to detect with our present methods of analysis and it is stated that "nothing published so far about the composition of the virus strains sheds any light on the nature of the biological differences between them nor on the origins of the strains".

A. Kleczkowski discusses the effects of non-ionizing radiations on viruses and B. Kassanis the effects of changing temperature on plant virus diseases.

Rod, J.

Obecné šlechtění a semenářství. (**General principles of breeding and seed growing**).

Státní pedagogické nakladatelství, n.p., Praha 1956 : Kčs. 12.70 : Pp. 256 : figs. : tables. [Mimeographed].

This book provides general instructions on plant breeding work together with outlines of Darwinism, Mendelism and Mičurinist genetics. Among the related topics discussed are experimental techniques, statistical methods, mutations, polyploidy and heterosis, examples being drawn from a number of crop plants including wheat, oats, rye, maize, barley, red clover, vetch, potato, flax and linseed and sunflower. A number of figures and diagrams are included in the text but there is no index.

Richharia, R. H.

Plant breeding and genetics in India. Volume 1.

Scientific Book Co., Patna 1957 : 2nd. Ed. : Rs. 18/12/– : Pp. ii + 410 : figs. : plates : tables.

The greater part of this new edition is unchanged as compared with the first, published in 1945 (cf. *PBA*, XVII, p. 349), it being the author's intention to include work carried out since that date in a second volume. The list of improved varieties of cotton, originally placed in the appendix, has now been moved to the end of the chapter on cotton. A second list of improved strains released from the Indian Agricultural Research Institute up to 1955 has been added to the appendix, together with a short list of promising foreign introductions and a catalogue of vegetable seeds now available in India at the Vegetable Breeding Substation at Katrain, in the Kulu Valley, Punjab. Readers will be especially glad to note that the vernacular names of the crops are now included in the index, which has been considerably enlarged, thus greatly increasing its usefulness.

32e beschrijvende rassenlijst voor landbouwgewassen met bijlagen 1957. (**Thirty-second descriptive list of agricultural crop plants, 1957**).

Rijkscommissie voor de Sammenstelling van de Rassenlijst voor Landbouwgewassen, Wageningen 1957 : f. 2.00 : Pp. 333 : tables.

The latest edition of this informative booklet and its English summary contains, as usual (cf. *PBA*, XXVI, p. 701), useful data on the agricultural merits of numerous crop varieties, information on the distribution of the most important

varieties in the Netherlands and a glossary of crop names in Dutch, German, English and French. One small point which a reader not very familiar with the names of plant breeding institutes in the Netherlands is likely to find unsatisfactory in this otherwise excellent reference work is the frequent use of such unexplained abbreviations as D.T.V., Z.P.C. and C.I.V. for the names of centres from which propagating material of varieties may be obtained.

Sánchez-Monge Parellada, E.
Catálogo genético de trigos españoles. **(Genetic catalogue of Spanish wheats).**
Monogr. Minist. Agric., Madr. 1957 : No. 8 : 250 pesetas : Pp. XII + 920 : 92 figs.

This monograph embodies the results of a study of the Spanish wheat varieties from the point of view of both morphological characters and features of interest to the plant breeder, which include tillering, time of ripening and resistance to cold, lodging, shedding and a number of diseases. Keys are given for the determination first of the species and then of the cultivars and these are followed by detailed descriptions of each cultivar in turn, some of them being illustrated. There are explanatory notes on the significance of some of the designations used in the common names of the cultivars and the volume is completed by a short bibliography.

Lips, E.
Die Reisernte der Ojibwa-Indianer. Wirtschaft und Recht eines Erntevolkes. **(The rice harvest of the Ojibwa Indians. Industry and law of a people living from harvesting wild plants).**
Akademie-Verlag, Berlin 1956 : DM 41.00 : Pp. xv + 391 : 175 figs. : 1 plate.

Julius and Eva Lips made a study of the territory of the Ojibwa Indians of Nett Lake in Northern Minnesota in 1947 and collected a quantity of data concerning not only the ethnology of this interesting people but also the wild plants that form the main basis of their subsistence. By far the most important of them is the wild rice plant, *Zizania aquatica*, and many historical data are given concerning the importance this plant has had in the shaping of the destinies of Indians and white settlers alike. A chapter is devoted to the botany of the species, in which it is distinguished from *Oryza sativa* and other *Oryza* spp., and from *Lolium temulentum*, which is taken to correspond to the *zizanion* of the bible. In view of its position in the tribe Oryzeae of the Gramineae the genus *Zizania* is considered to be of Asiatic origin. Information is given on the ecology of the species and its developmental stages, the two forms of it that are recognized, the pests and diseases that attack it and the many myths about its origin. Another chapter describes the complicated routine that has been elaborated for harvesting, storing and utilizing it, an aspect dealt with again in the second half of the book, which is devoted to the ethnology of the Indians and describes the complicated rituals that have grown up round each of the important developmental stages of this remarkable plant; from this we see that it has been the central point round which the whole social development of this people has revolved and has led to the growth of a system of laws and usages all designed for the common good of the community on the basis that "what is good for the rice is right, what is bad for the rice is bad."
The volume is completed by a bibliography and a collection of original photographs.

Kolář, J.
Štírovník obecný a bažinný. **(*Lotus corniculatus* and *L. uliginosus*).**
Československá Akademie Zemědělských Věd, Praha 1956 : Kčs. 21.80 : Pp. 219 : 35 figs. : 78 tables : 14 diags. : 1 map.

The author of this posthumous work was one of the foremost Czech authorities on leguminous forage plants and he paid particular attention to birdsfoot trefoil. The present volume, which has been prepared for publication by A. Folk, is a useful compilation on all aspects connected with this crop which has been receiving increasing attention from plant breeders in recent years.
There are nine chapters all told. The first eight deal with the systematics of the species, biology and adaptation, conditions required for successful growth, either alone or in mixtures, and seed production. The last chapter is devoted to breeding and deals with methods, selection criteria and available breeding material.
Numerous photographs are included and the book concludes with a bibliography of articles, mainly Czech, dealing with the crop.

Hogen Esch, J. A., Nijdam, F. E. & Siebeneick, H.
Dutch potato atlas. First supplement.
H. Veenman & Zonen, Wageningen undated : f. 7.65 : unpaginated : plates.

This supplement to the above guide (cf. *PBA*, XXVI, p. 704) gives detailed descriptions of

Majestic, Climax (Bintje x Record), Prefect (Present x Frühmölle), Maritta (Seedling 66/102 x Mittelfrühe [Mid-early]) and Tedria from a cross of [(Bevelander x Triumf [Triumph]) x *Solanum demissum*] x Furore with Saskia x Frühmölle (cf. *PBA*, XXIV, Abst. 433 and XXVI, Abst. 2501).

HINFNER, K. & CSÁK, Z.
A burgonyagumó betegségei és károsodásai. **(Diseases and injuries of the potato tuber).**
Mezőgazdasági Kiadó, Budapest 1956 : 30 Ft. : Pp. 155 : plates : tables.

Forty disorders of the potato tuber, comprising nonparasitic, viral, bacterial and fungal diseases as well as pests, are described in this little book, the first in a series of popular illustrated pocket books produced by the Hungarian National Institute of Varietal Testing. In each description the name of the causal agent and its prevalence in Hungary are noted, followed by an account of the symptoms of the disorder and either a note on suitable treatment or a reference to the appropriate section of a later chapter on control measures. The most attractive feature of the book is provided by the full-page coloured illustrations which accompany each description; these are well done and well reproduced. After the descriptions, which form the bulk of the book, there follows the above-mentioned chapter on control; a key to the disorders, based on symptoms; a list showing the degree of resistance possessed by 22 commercial varieties to certain diseases; an account of a standard method of determining the resistance index; and tables giving specifications for maximum proportion of damaged tubers allowed in different grades of potatoes. A short bibliography is provided.

MALJCEV, A. M.
(Cotton).
Izdateljstvo Akademii Nauk Uzbekskoĭ SSR, Taškent 1956 : 8r. 60k. : Pp. 129 : 23 figs. : 34 tables.

The first volume of this monograph on the cotton plant is introductory and gives information on the present distribution of cotton cultivation in different parts of the world, and its cultivation in prehistoric times in India, China and America and in the Middle Ages elsewhere. An extensive section then deals with the development of cotton growing in Russia, based first on *Gossypium herbaceum*, later on *G. hirsutum* varieties introduced from America and then on Soviet selections from them, such as Navrockiĭ, and later still on a series of wilt-resistant varieties, which are enumerated, and a certain number of *G. barbadense* forms produced by selection from Fuadi and other Egyptian cottons; these improved cottons have raised the yield by 25–30%, the ginning outturn by 4–5% and the lint length by 5–6 mm. The effects of mechanization and irrigation in raising cotton yields are also examined.

Other chapters in the book give information on the development of the cotton industry in China, Bulgaria, Rumania, Hungary, Albania and Viêt-nam, with notes on the behaviour of Soviet varieties introduced into some of those countries. Figures are given for cotton production in other countries and a final chapter deals with lint quality, the lint characteristics of the main cotton species being explained and a description given of how, starting in 1884, the local cottons belonging to *G. arboreum* were gradually replaced in Russia by improved forms of *G. hirsutum* and *G. barbadense*. The important role of plant breeding in producing climatically adapted forms of these two species, satisfying the technological requirements of the industry, is specially emphasized and tabular data are presented showing how the Soviet varieties compare in lint length with those of other countries; some 80% of the Soviet varieties today have a lint length of 30–33 mm. and some 10% of them between 34 and 40 mm.

SIMLOTE, K. M.
Cotton improvement in India.
Sat-Prachar Press, Indore 1956 : Pp. viii + 201 : maps : plates : tables.

Written by the Second Economic Botanist of the Institute of Plant Industry, Indore, the purpose of this book is to provide a survey of the cotton breeding carried out in India during the past thirty or more years through the efforts of the Indian Central Cotton Committee and state departments of agriculture. It is intended for both students and research workers. After an introductory chapter, short and elementary chapters on the cottons grown in India, general aspects of cultivation of the crop in the Union, the botanical classification of *Gossypium* according to the scheme of Hutchinson *et al.*, breeding methods and statistical procedures are given as a background to the main part of the book, chapter VII, in which cotton production and improvement in the various tracts of the different states are reviewed in detail. Genetical investigations on characters of economic significance have been omitted and the important role of technological research has been neglected. The next chapter outlines extension work while the last offers some account of the most important

pests and diseases and their control by chemical and other methods. Appendix I gives information on the organization and financing of the activities of the Indian Central Cotton Committee. Appendix II lists the improved varieties released and their chief characteristics. Cotton breeding stations are listed in Appendix III. A bibliography, one-page glossary mainly of Indian terms, an index of varieties and general index complete the book, which is illustrated by photographs and sketch maps. Many facts concerning the development of improved cottons by acclimatization, selection and intraspecific and interspecific hybridization have been conveniently brought together but those consulting the work must be prepared to endure a slipshod style and, particularly in the botanical and varietal designations, many typographical errors. A short list of errata does pathetically little to remedy these faults. An authoritative guide to the regional and varietal complexities of cotton production in the Indian Union is much needed: it is therefore all the more disappointing that this survey does not reach a higher standard.

BOWMAN, F. T.
Citrus-growing in Australia.
Angus & Robertson, Sydney & London 1956 : 63s. : Pp. v + 311 : 104 figs. : 37 tables.

Although citrus fruits occupy the foremost position in the production of tropical and subtropical fruits in Australia, this is the first general reference book to be published on citrus growing in that country. The book begins with chapters on the history of the industry in Australia, the species, varieties and hybrids cultivated, choice of variety and rootstock, and propagation of nursery trees. A discussion of districts, climates and soils suitable for citrus growing leads to considerations of the choice, design and development of sites for orchards, planting, and the development of the trees up to bearing age and their management during this period. The remaining chapters deal with mineral nutrition and fertilizers, soil management, irrigation, measures against pests, diseases and frost, pruning and renovation practices, cropping and causes of fruit loss and wastage, and, lastly, harvesting and preparation for the market. An appendix gives keys to the genera and species of citrus fruits. A bibliography lists general works and, for each chapter, selected references. A good index is provided and the text is well illustrated by over a hundred photographs, graphs and diagrams. The author, who is Principal Research Officer in the New South Wales Department of Agriculture, may be congratulated upon having produced an excellent manual.

NEW JOURNALS

Bruinsma Bulletin.

This bulletin is being issued occasionally by the Bruinsma Hybrid Seed Company in the Netherlands and deals with the production of F_1 hybrids in horticultural crops, especially tomatoes. It is to give information not only on hybrids produced by the firm but also on other developments in this field of breeding. The first number (December 1956) describes the older tomato hybrids Single Cross, UNIC and Gouden Ster [Golden Star] introduced by the company. The second number (February 1957) provides an account of three new hybrids of tomato (cf. Abst. 4569). Further information may be obtained from the Bruinsma Hybrid Seed Company, Postbox 24, Naaldwijk.

The Indian Journal of Agronomy.

The Indian Society of Agronomy was founded in 1955 and now includes among its activities publication of the above quarterly journal, the first number of which is dated August 1956. Contributions on agronomic research and practices, review articles and news items are provided. The first number includes two articles by D. K. Misra on drought resistance in wheat and maize varieties (cf. Absts. 3888 and 4010). Further information may be obtained from the Secretary, Indian Society of Agronomy, Indian Agricultural Research Institute, New Delhi 12.

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